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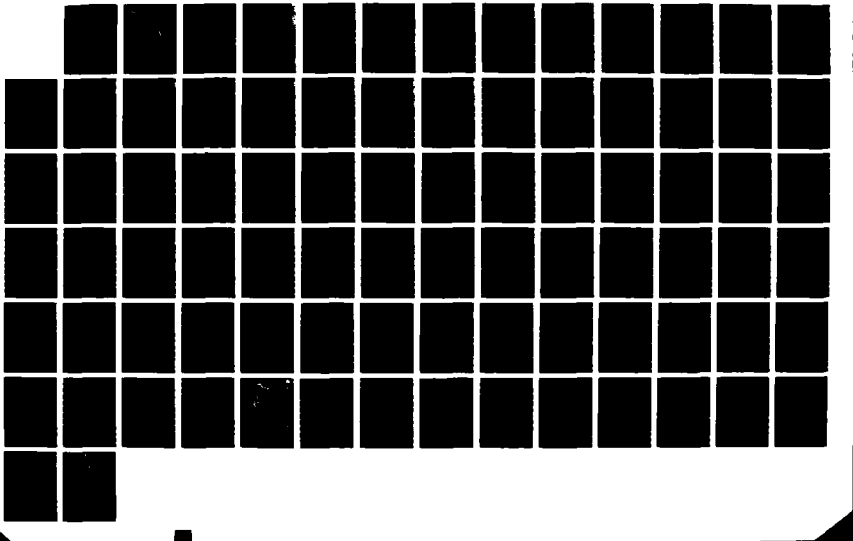

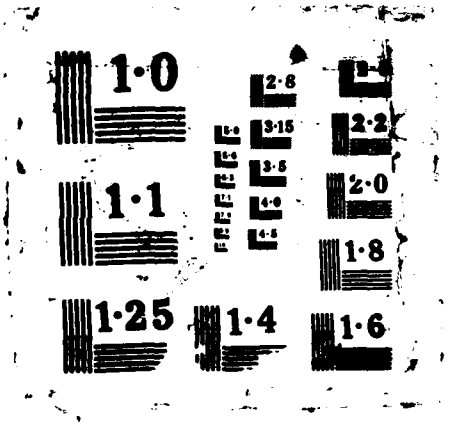
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US Army Corps of Engineers
Construction Engineering Research Laboratory

USA-CERL TECHNICAL REPORT N-87/18
July 1987

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SOIL CONSERVATION SERVICE
U.S. DEPARTMENT OF AGRICULTURE

An Interactive Soils Information System User's Manual

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by
Pamela J. Thompson
Keith Young
William D. Goran
Al Moy

"Original contains color plates: All DTIC reproductions will be in black and white"

This report supersedes Technical Report N-163, dated September 1983.

This report describes and provides basic instructions for using the Interactive Soils Information System, a user-friendly family of programs designed by the U.S. Army Construction Engineering Research Laboratory (USA-CERL) for efficient retrieval, analysis, and use of soils data from the U.S. Department of Agriculture's Soil Conservation Service (USDA-SCS).

Recent developments include: another data base (SOI-6), the Map Unit Use File System (MUUFS) and the Computer-Aided Land Evaluation System (CALES) to access the new data base, and several new options within the Multiple Parameter Series Search (MPSS).

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FOREWORD

This research was conducted for the U.S. Department of Agriculture Soil Conservation Service (SCS), under a cooperative agreement between SCS and the U.S. Army Construction Engineering Research Laboratory (USA-CERL). The SCS Technical Monitors were Bill Reybold, Keith Young, and Maurice Mausbach.

The work was performed by the Environmental Division (EN) of USA-CERL. Dr. R. K. Jain is Chief of EN. Appreciation is expressed to Lynn Engelman, Program Coordinator for the Environmental Technical Information System (ETIS) Project, University of Illinois, Department of Urban and Regional Planning, who helped plan and review this manuscript and to Maurice Mausbach of SCS for reviewing the manuscript and assisting with the appendixes. Mr. Al Moy is an independent researcher contracted for this work.

COL Norman C. Hintz is Commander and Director of USA-CERL and Dr. L. R. Shaffer is Technical Director.

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AN INTERACTIVE SOILS INFORMATION SYSTEM USER'S MANUAL

1 INTRODUCTION

Background

The Environmental Technical Information System (ETIS) is an umbrella structure which includes a number of computer-based analysis and information systems developed by researchers at the U.S. Army Construction Engineering Research Laboratory (USA-CERL). These systems provide information resources and analysis tools to environmental planners and land managers.

One of the major ETIS components is the Interactive Soils Information System (ISIS); a user-friendly family of programs designed for efficient retrieval, analysis, and use of the U.S. Department of Agriculture's Soil Conservation Service (USDA-SCS) soils data.

Originally, the system included three programs that accessed the SCS Soils 5 (SOI-5) data base: (1) the Soils Information Retrieval System (SIRS), (2) the Line Printer Soils Information Retrieval System (LPSIRS), and (3) the Multiple Parameter Series Search (MPSS). The programs were described in Technical Report N-163 published cooperatively by USA-CERL and USDA-SCS. This report supersedes Technical Report N-163, dated September 1983.

Developments in the soils system since 1983 include another data base (SOI-6) and two programs that access that data: the Map Unit Use File System (MUUFS), and the Computer-Aided Land Evaluation System (CALES). The system also contains several new options within MPSS.

The SCS gathers data on soil series as they are identified throughout the United States. This data, which has been systematically collected by SCS for decades, has considerable application to current Department of the Army (DA) efforts to schedule, maintain, and evaluate training ranges and maneuver areas. Together, the SOI-5 and SOI-6 databases include information on more than 16,000 soil series and more than 175,000 soil mapping units.

Working in cooperation with SCS, researchers at USA-CERL adapted the soils data to the ETIS environment to create an interactive data retrieval and search capability for both SCS and non-SCS users. USA-CERL designed these systems to quickly access selected information, to rapidly search massive databases to determine various relationships, and to allow users to easily move from one system to another. SCS continues to update and maintain the original data, making up to 4,000 changes per month. USA-CERL obtains data tapes from the Statistical Laboratory at Iowa State University in Ames, IA, to update the soils system. The SOI-5 database is updated bimonthly and the SOI-6 is updated every 6 months.

Objective

The objective of this report is to describe the capabilities of the Interactive Soils Information System and to provide basic user instructions for operating and retrieving data from it.

Approach

The five component subsystems of the soils system are described in terms of their capabilities and the type of data they provide. Instructions and commands for accessing and using the system are provided. Points of contact for additional information are also provided.

Mode of Technology Transfer

The soils system is now available through ETIS, which has nationwide access and is supported through the ETIS Project operated by the University of Illinois. Information is available from the ETIS Project, Department of Urban and Regional Planning, University of Illinois, 909 West Nevada, Urbana, IL 61801. (See page 46 for information and accounts.)

2 SOIL TERMINOLOGY

The following terms are used by the Soil Conservation Service.*

Taxonomic unit: A named kind of soil (taxon) that has specific properties with defined limits or ranges in characteristics. Each class within the six categories of "Soil Taxonomy" is a taxonomic unit.

Soil series: A group of soils (polypedons) having horizons that are similar in differentiating characteristics (texture, color, structure, consistence, reaction, content of carbonates or other salts, content of organic matter, and minerological composition). Except for differences in texture of the surface layer or of the underlying material, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soil map unit: An area of soil(s) delineated on a soil map. It contains one or more taxonomic units and nearly always some inclusions.

Soil mapping unit: The aggregate of all the delineated bodies (map units) of a kind of soil(s) identified by the same name (symbol) on a soil map or in a soil survey area.

Phase of a taxonomic unit: A subdivision of a taxon based on texture, stoniness, erosion, salinity, contrasting substratum, etc. Generally used in combination with descriptive terms that define the slope, physiographic position, or special environmental characteristics of the map unit. A phase bridges the gap between the taxon and the map unit.

Phase of a soil series: A subdivision based on one or more characteristics that are potentially significant to use or management of the soil. The most common basis for delineating phases is slope, surface texture, erosion, stoniness, salinity, contrasting substratum, physiographic position, and flooding frequency.

Consociation: A map unit that is dominated by a single kind of soil (taxon) or miscellaneous area. The soil may be named at any taxonomic level (Udorthents, steep; Alpha silt loam, 2 to 6 percent slope).

Undifferentiated group: Two or more taxonomic units that are not regularly associated together. The members of an undifferentiated group commonly are similar enough in morphology and/or behavior so that separating them on the map is not important for the objective of the survey. Such a unit is named by combining the names of the taxonomic units with "and."

Soil complex: Two or more taxonomic units that occur together in a more or less regular pattern and are so intricately mixed, or so small in size, that it is not practical to separate them in mapping. The members of a complex commonly have contrasting morphology, as well as potentially unique use or management, but cannot be separated at the map scale being used.

Soil association: An association is similar to a soil complex except the members of an association could be separated at scales commonly used on detailed soil maps (15,840 to 24,000). They usually contain more inclusions than complexes.

---

*Terms provided by Mr. Roy M. Smith, USDA Soil Conservation Service (retired).

3 SOILS DATA

The data for the Interactive Soil Information System (ISIS) are the Soil Interpretations Records (SOI-5 data) and the Map Unit Records (SOI-6 data). SCS soil scientists develop these data in the process of making soil surveys, using nationally approved guidelines and definitions. The data are then reviewed and approved by the state staff and the National Technical Center (NTC) staff. Each state conservationist is responsible for the accuracy of all soil records made in the state. The NTC and National Headquarters staff of USDA-SCS coordinate records among the states.

Approved soil interpretations and map unit records are entered into a computer at the Statistical Laboratory, Iowa State University, Ames, IA. The laboratory runs computerized edit checks on the data, creates use interpretation tables based on soil property values, stores the data, and makes updates as they are received. Updated data tapes are sent to ETIS every 2 months for SOI-5 data and every 6 months for SOI-6 data.

The SOI-5 data base is accessed for SIRS, LPSIRS and MPSS. SOI-5 is a data base for soil series or phases of series created by inputting data from the Soil Interpretations Record (Figure 1). A series is the lowest unit in the USDA taxonomic system. At present, over 16,000 different series have been mapped and described in the United States. In SOI-5, some of these series have multiple records. This may occur because certain landscape conditions are influencing the overall properties of a soil. For example, the series Morristown has three records. When SIRS is accessed and Morristown is selected (user input is underlined in this report for easier identification, but should not be underlined in actual use) the output looks like this:

Selection (CR if done) : morristown

Multiple records for morristown (select by record numbers):
oh0308 stoney
oh0183 reclaimed
oh0172

Because many soil series have multiple SOI-5 records, the total SOI-5 data base currently includes over 23,000 records. New records are added with each update as new series are defined during ongoing mapping activities.

Each SOI-5 record consists of a brief soil description as well as estimates of soil properties such as texture, permeability, depth to bedrock, frequency and duration of flooding, yield estimates of crops, woodland and range production under stated management systems, suitability or limitations of soils for specified land uses, and soil features affecting specified land uses.

The SOI-6 data base is accessed for the MUUFS. (SOI-6 data can also be accessed from MPSS.) SOI-6 is a data base for the map unit and contains information from the Map Unit Record (Figure 2), including mapping unit characteristics, critical phase criteria and survey acreage by county. The USDA-SCS uses this data base to produce tables for soil survey manuscripts, resource inventories, technical guides, and other outputs. SOI-6 data is reported by each state and entered into the national data base. Because many states have not yet completed mapping all counties, this data base is not complete.

(1)

SOIL INTERPRETATIONS RECORD*

KEYING ONLY		
RECORD NO.	CONTROL WORD	NO.
	MLRA	001
	STATE	011

MLRA(S) 95B 105, 108, 110, 111, 114, 113, 115 KIND OF UNIT SERIES UNIT NAME CAMDEN

STATE ILL NO S RECORD NO. 0002 AUTHOR(S) JCD DATE 9-85 REVISED X UNIT MODIFIER NONFLOODED

CLASSIFICATION AND BRIEF SOIL DESCRIPTION

CLASS DESCR 021 031 2 3 4 5

THE CAMDEN SERIES CONSISTS OF WELL DRAINED SOILS FORMED IN LOESS AND STRATIFIED OUTWASH ON TERRACES AND OUTWASH PLAINS. THE SURFACE LAYER IS DARK GRAYISH BROWN SILT LOAM 19 INCHES THICK. THE SUBSURFACE LAYER IS DARK GRAYISH BROWN SILT LOAM 5 INCHES THICK. THE SUBSOIL IS YELLOWISH BROWN SILT LOAM AND SILTY CLAY LOAM IN UPPER 21 INCHES AND YELLOWISH BROWN AND BROWN LOAM AND SANDY LOAM IN LOWER 27 INCHES. THE SUBSTRATUM IS YELLOWISH BROWN STRATIFIED SANDY LOAM, LOAM AND SANDY CLAY LOAM. SLOPES RANGE FROM 0 TO 30 PERCENT. MOST AREAS ARE USED FOR CROPLAND.

ESTIMATED SOIL PROPERTIES

FOOTNOTE	DEPTH (IN)	USDA TEXTURE	UNIFIED	AASHO	FRACT. 3 IN. (PCT)	PERCENT OF MATERIAL LESS THAN 3 IN, PASSING SIEVE 4	10	40	200	LIQUID LIMIT	PLASTICITY INDEX
PROP 041	0-14	SIL	CL, ML, CL-ML	A-4, A-6	0	100	100	95-100	90-100	20-35	3-15
2	0-14	SICL	CL	A-6	0	100	100	95-100	90-100	30-40	15-25
3	14-35	SIL, SICL	CL	A-6	0	100	100	95-100	90-100	25-40	15-25
4	35-62	CL, SL, SIL	ML, SC, SM, CL	A-2, A-4, A-6	0-5	90-100	85-100	60-100	30-70	20-40	3-15
5	62-77	SR-SL-SIL	SM, SC, ML, CL	A-2, A-4	0-5	90-100	80-100	50-80	20-60	<25	3-10
6											

	DEPTH (IN)	CLAY (PCT OF <2MM)	MOIST BULK DENSITY (G/CM³)	PERMEABILITY (IN/HR)	AVAILABLE WATER CAPACITY (IN/IN)	SOIL REACTION (pH)	SALINITY (MMHOS/CM)	SHRINK-SWELL POTENTIAL	EROSION FACTORS K	T	WIND EROD. GROUP	ORGANIC MATTER (PCT)	CORROSIVITY STEEL	CONCRETE
PROP 051	SAME DEPTH AS ABOVE	14-27	1.15-1.35	0.6-2.0	0.22-0.24	5.1-7.3	—	LOW	.37	5	6	1-2	LOW	MODERATE
2		27-35	1.30-1.50	0.6-2.0	0.18-0.20	5.1-7.3	—	MODERATE	.37	4	7	.5-1		
3		22-35	1.35-1.55	0.6-2.0	0.16-0.20	5.1-7.3	—	MODERATE	.37					
4		18-30	1.45-1.65	0.6-2.0	0.11-0.22	5.6-7.3	—	LOW	.37					
5		5-20	1.55-1.75	0.6-6.0	0.11-0.22	5.6-8.4	—	LOW	.37					
6														

	FLOODING FREQUENCY	DURATION	MONTHS	HIGH WATER TABLE DEPTH (FT)	KIND	MONTHS	CEMENTED PAN DEPTH (IN)	HARDNESS	BEDROCK DEPTH (IN)	HARDNESS	SUBSIDENCE INITIAL (IN)	TOTAL (IN)	HYD GRP	POTENTIAL FROST ACTION
PROP 061	NONE			>6.0			—		>60		—		B	HIGH

	FOOTNOTES	SANITARY FACILITIES	KEYING ONLY	FOOTNOTES	CONSTRUCTION MATERIAL
SEPTIC 071	SEPTIC TANK ABSORPTION FIELDS	0-8% : SLIGHT 8-15% : MODERATE - SLOPE 15+% : SEVERE - SLOPE	FILL 191	ROADFILL	0-15% : GOOD 15-25% : FAIR - SLOPE 25+% : POOR - SLOPE
LAGOON 081	SEWAGE LAGOONS	0-2% : MODERATE - SEEPAGE 2-7% : MODERATE - SEEPAGE - SLOPE 7+% : SEVERE - SLOPE	SAND 201	SAND	IMPROBABLE ; EXCESS FINES

*A soil scientist inputs the soil properties for each record. The soil interpretations are computer generated from tables using the soil property values.

Figure 1. Soil Interpretations Record.

TRENCH	121	SANITARY LANDFILL TRENCH	0-15%: SEVERE - SEEPAGE 15+%: SEVERE - SEEPAGE - SLOPE	
SANARE	121	SANITARY LANDFILL AREA	0-8%: SLIGHT 8-15%: MODERATE - SLOPE 15+%: SEVERE - SLOPE	
COVER	121	DAILY COVER FOR LANDFILL	0-8%: FAIR - TOO CLAYEY 8-15%: FAIR - SLOPE, TOO CLAYEY 15+%: POOR - SLOPE	
		FOOTNOTES	BUILDING SITE DEVELOPMENT	
EXCAV	121	SHALLOW EXCAVATIONS	0-8%: SLIGHT 8-15%: MODERATE - SLOPE 15+%: SEVERE - SLOPE	
DWEL	121	DWELLINGS WITHOUT BASEMENTS	0-8%: MODERATE - SHRINK-SWELL 8-15%: MODERATE - SHRINK-SWELL - SLOPE 15+%: SEVERE - SLOPE	
DWEL	121	DWELLINGS WITH BASEMENTS	0-8%: SLIGHT 8-15%: MODERATE - SLOPE 15+%: SEVERE - SLOPE	
BLDG	121	SMALL COMMERCIAL BUILDINGS	0-4%: MODERATE - SHRINK-SWELL 4-8%: MODERATE - SHRINK-SWELL - SLOPE 8+%: SEVERE - SLOPE	
ROADS	121	LOCAL ROADS AND STREETS	0-15%: SEVERE - LOW STRENGTH - FROST ACTION 15+%: SEVERE - LOW STRENGTH - SLOPE - FROST ACTION	
LAWNS	121	LAWNS, LANDSCAPING, AND GOLF FAIRWAYS	0-8%: SLIGHT 8-15%: MODERATE - SLOPE 15+%: SEVERE - SLOPE	
		FOOTNOTES	REGIONAL INTERPRETATIONS	
REGION	121			

GRAVEL	11	GRAVEL	IMPROBABLE: EXCESS FINES
SOIL	221	TOPSOIL	0-8% SIL: GOOD 8-15% SIL: FAIR - SLOPE 0-8% SICL: FAIR - TOO CLAYEY 8-15% SICL: FAIR - TOO CLAYEY, SLOPE 15+%: POOR - SLOPE
		FOOTNOTES	WATER MANAGEMENT
PONDRS	231	POND RESERVOIR AREA	0-3%: MODERATE - SEEPAGE 3-8%: MODERATE - SEEPAGE - SLOPE 8+%: SEVERE - SLOPE
DIKES	241	EMBANKMENTS DIKES AND LEVEES	SEVERE - PIPING
PONDAQ	251	EXCAVATED PONDS AQUIFER FED	SEVERE - NO WATER
DRAIN	261	DRAINAGE	DEEP TO WATER
IRRIG	271	IRRIGATION	0-3%: ERODES EASILY 3+%: SLOPE, ERODES EASILY
TERRAC	281	TERRACES AND DIVERSIONS	0-8%: ERODES EASILY 8+%: SLOPE, ERODES EASILY
WATERW		GRASSED WATERWAYS	0-8%: ERODES EASILY 8+%: SLOPE, ERODES EASILY

Figure 1. (Cont'd)

UNIT NAME CAMDEN
UNIT MODIFIER NONFLOODED

RECREATIONAL DEVELOPMENT

	FOOTNOTE	KEYING ONLY		FOOTNOTE
CAMP AREAS	0-8%: SLIGHT 8-15%: MODERATE - SLOPE 15+%: SEVERE - SLOPE	PLAYGD	PLAYGROUNDS	0-2%: SLIGHT 2-6%: MODERATE - SLOPE 6+%: SEVERE - SLOPE
PICNIC AREAS	0-8%: SLIGHT 8-15%: MODERATE - SLOPE 15+%: SEVERE - SLOPE	PATHS	PATHS AND TRAILS	0-8%: SLIGHT 15-25%: SEVERE - ERODES EASILY 25+%: SEVERE - SLOPE, ERODES EASILY

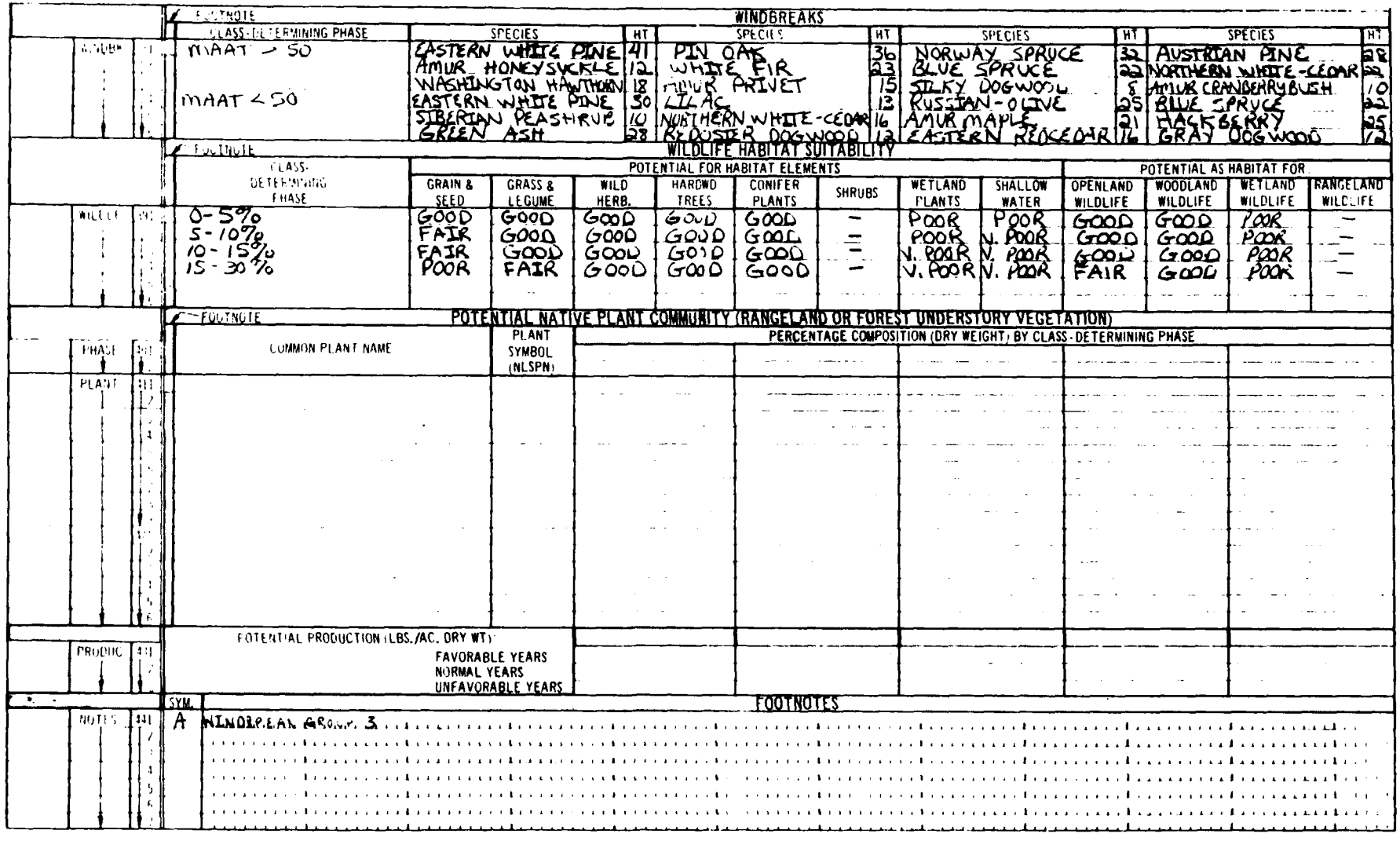
CAPABILITY AND YIELDS PER ACRE OF CROPS AND PASTURE (HIGH LEVEL MANAGEMENT)

SYMBOL	CLASS-DETERMINING PHASE	CAPABILITY NIRR	CAPABILITY IRR.	CORN (BU) NIRR	CORN (BU) IRR.	SOYBEANS (BU) NIRR	SOYBEANS (BU) IRR.	WHEAT WINTER (BU) NIRR	WHEAT WINTER (BU) IRR.	OATS (BU) NIRR	OATS (BU) IRR.	GRASS LEGUMES HAY (TONS) NIRR	GRASS LEGUMES HAY (TONS) IRR.	BROMEGRASS-ALFALFA (AUM) NIRR	BROMEGRASS-ALFALFA (AUM) IRR.	NIRR	IRR.
CrA	0-2%	1		125		39		55		72		5.0		8.3			
	2-5%	2E		124		39		54		71		5.0		8.2			
	2-5% ERODED	3E		120		37		53		69		4.8		8.0			
	5-10%	3E		121		38		53		70		4.9		8.1			
	5-10% ERODED	3E		117		37		52		68		4.7		7.8			
	5-10% SEVERE	4E		115		30		51		66		4.6		7.6			
	10-15% ERODED	3E		113		35		50		65		4.5		7.5			
	10-15% SEVERE	4E		109		33		48		62		4.2		6.9			
	15-30% ERODED	6E		—		—		—		—		3.9		6.4			

WOODLAND SUITABILITY

SYMBOL	CLASS-DETERMINING PHASE	ORD SYM	MANAGEMENT PROBLEMS: EROSION HAZARD	EQUIP. LIMIT	SEEDLING MORT'Y.	WINDTH. HAZARD	PLANT COMPET.	POTENTIAL PRODUCTIVITY: COMMON TREES	SITE INDEX	TREES TO PLANT
WoB	0-12% MAAT >50	7A	SLIGHT	SLIGHT	SLIGHT	SLIGHT	SEVERE	YELLOW-POPLAR	95	WHITE OAK
	12-30% MAAT >50	7R	MODERATE	MODERATE	SLIGHT	SLIGHT	SEVERE	WHITE OAK	85	BLACK WALNUT
								NORTHERN RED OAK	85	GREEN ASH
								SWEET GUM	80	EASTERN WHITE PINE
								GREEN ASH	76	RED PINE
										YELLOW-POPLAR
										BLACK LOCUST
										WHITE ASH
	0-12% MAAT <50	3A	SLIGHT	SLIGHT	SLIGHT	SLIGHT	MODERATE	SUGAR MAPLE	60	EASTERN WHITE PINE
	12-30% MAAT <50	3R	MODERATE	MODERATE	SLIGHT	SLIGHT	MODERATE	NORTHERN RED OAK	69	RED PINE

Figure 1. (Cont'd)



WINDBREAKS

CLASS-DETERMINING PHASE	SPECIES	HT	SPECIES	HT	SPECIES	HT	SPECIES	HT
MAAT > 50	EASTERN WHITE PINE	41	PIN OAK	36	NORWAY SPRUCE	32	AUSTRIAN PINE	28
	AMUR HONEYSUCKLE	12	WHITE FIR	23	BLUE SPRUCE	22	NORTHERN WHITE-CEDAR	22
	WASHINGTON HAWTHORN	18	AMUR PRIVET	15	SILKY DOGWOOD	8	AMUR CRANBERRYBUSH	10
MAAT < 50	EASTERN WHITE PINE	30	LILAC	13	RUSSIAN-OLIVE	25	BLUE SPRUCE	22
	SIBERIAN PEASHRUB	10	NORTHERN WHITE-CEDAR	16	AMUR MAPLE	21	HACKBERRY	25
	GREEN ASH	28	REDOSIER DOGWOOD	12	EASTERN REDCEDAR	16	GRAY DOGWOOD	12

WILDLIFE HABITAT SUITABILITY

CLASS-DETERMINING PHASE	POTENTIAL FOR HABITAT ELEMENTS								POTENTIAL AS HABITAT FOR			
	GRAIN & SEED	GRASS & LEGUME	WILD HERB.	HARDWD TREES	CONIFER PLANTS	SHRUBS	WETLAND PLANTS	SHALLOW WATER	OPENLAND WILDLIFE	WOODLAND WILDLIFE	WETLAND WILDLIFE	RANGELAND WILDLIFE
0-5%	GOOD	GOOD	GOOD	GOOD	GOOD	—	POOR	POOR	GOOD	GOOD	POOR	—
5-10%	FAIR	GOOD	GOOD	GOOD	GOOD	—	POOR	V. POOR	GOOD	GOOD	POOR	—
10-15%	FAIR	GOOD	GOOD	GOOD	GOOD	—	V. POOR	V. POOR	GOOD	GOOD	POOR	—
15-30%	POOR	FAIR	GOOD	GOOD	GOOD	—	V. POOR	V. POOR	FAIR	GOOD	POOR	—

POTENTIAL NATIVE PLANT COMMUNITY (RANGELAND OR FOREST UNDERSTORY VEGETATION)

COMMON PLANT NAME	PLANT SYMBOL (NLSPN)	PERCENTAGE COMPOSITION (DRY WEIGHT) BY CLASS-DETERMINING PHASE				

POTENTIAL PRODUCTION (LBS./AC. DRY WT)

FAVORABLE YEARS					
NORMAL YEARS					
UNFAVORABLE YEARS					

FOOTNOTES

SYM. A WINDBREAK GROUP 3

Figure 1. (Cont'd)

MAP UNIT RECORD

SCS-SS-6
1-79

NAME OF SOIL SURVEY AREA: DEWITT COUNTY

SURVEY ACREAGE BY COUNTIES			
COUNTY 1		COUNTY 2	
IN AREA	TOTAL	IN AREA	TOTAL

FIELD SYMBOL	KIND	FIELD MAP UNIT NAME	MAP UNIT ACREAGE COUNTY 1	MAP UNIT ACREAGE COUNTY 2
134C2	CSO	CAMDEN SILT LOAM, 5 TO 10 PERCENT SLOPES, ERODED	575	

RECOM SYMBOL	MLRA	RECOMMENDED MAP UNIT NAME
134C2	108	CAMDEN SILT LOAM, 5 TO 10 PERCENT SLOPES, ERODED

APPROVED SYMBOL	DATE MO	DATE YR	APPROVED MAP UNIT NAME

KEYPUNCH OPERATOR DUPLICATE FIELD SYMBOL ON ALL CARDS

PER CENT OF UNIT	INTERPRETATION RECORD NUMBER	CRITICAL PHASE CRITERIA (use first line for single-taxon unit or first taxon of multi-taxa unit, second line for second unit, etc.) SLOPE	USDA TEXTURE	FLOODING	OTHER (growing season rainfall, erosion, aspect, etc.)
	IL0002	5-10	SIL	NONE	ERODED MAAT > 50

ADDITIONAL SYMBOLS ON FIELD SHEETS (if more than 14, use second line)

1	2	3	4	5	6	7	8	9	10	11	12	13	14
243C2	131B												

ADJUSTED LAYER DEPTH FOR MAP UNIT OR COMPONENTS OF MULTI-TAXA UNITS

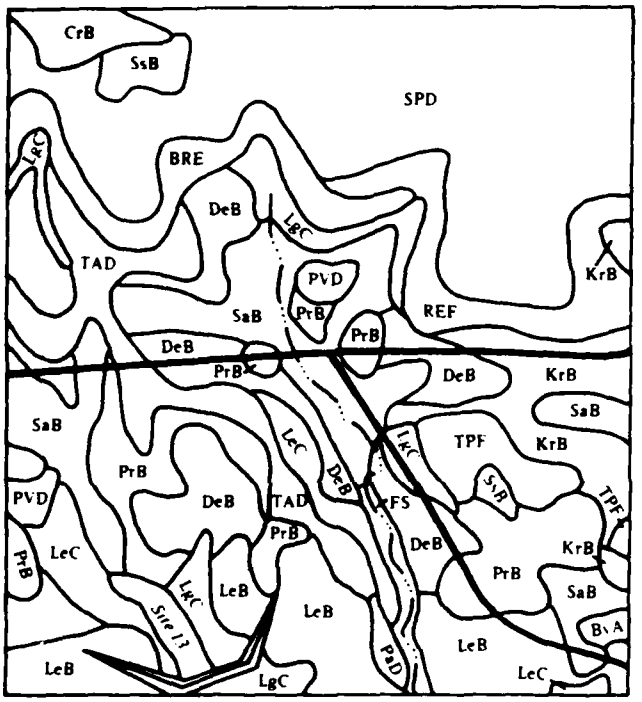
MAP UNIT OR FIRST TAXON						SECOND TAXON (use second line for third taxon)					
LAYER 1	LAYER 2	LAYER 3	LAYER 4	LAYER 5	LAYER 6	LAYER 1	LAYER 2	LAYER 3	LAYER 4	LAYER 5	LAYER 6
0-4	4-30	30-45	45-60								

RANGE SITE NAME (use first line for single-taxon unit or first taxon of multi-taxa unit, second line for second unit, etc.)

Figure 2. Map Unit Record.

Map units are the soil areas delineated on a soils map. They can be a consociation, an undifferentiated group, a soil complex, or a soil association. Figure 3, a portion of the Bell County, TX soil survey map, illustrates the map unit concept.

The data used for ISIS, SOI-5, and SOI-6 does not provide information about where, within a geographical area, a map unit or soil series occurs. (SOI-6 does provide the total number of acres within a county, state, or major land resource area [MLRA] for specific map units.) Exact locational information is available from soil survey reports obtainable from SCS state and local offices. Generally, each survey report includes a series of large-scale maps. Usually, these maps consist of map unit areas superimposed on aerial photographs.



BRE - Brackett association, rolling
ByA - Branyon clay, 0 to 1 percent slopes
CrB - Crawford clay, 1 to 3 percent slopes
DeB - Denton silty clay, 1 to 3 percent slopes
Fs - Frio silty clay, frequently flooded
KrB - Krum silty clay, 1 to 3 percent slopes
LeB - Lewisville silty clay, 1 to 3 percent slopes
LeC - Lewisville silty clay, 3 to 5 percent slopes
LgC - Lewisville-Altoga complex, 2 to 5 percent slopes
PaD - Patrick soils, 1 to 8 percent slopes
PrB - Purves silty clay, 1 to 4 percent slopes
PVD - Purves association, undulating
REF - Real association, hilly
SaB - San Saba clay, 1 to 3 percent slopes
SsB - Speck soils, 1 to 3 percent slopes
SPD - Speck association, undulating
TAD - Tarrant association, undulating
TPF - Tarrant-Purves association, rolling

Figure 3. Section of Bell County, TX soil survey map. Scale 1:20000.

4 ACCESS TO THE SOILS INFORMATION SYSTEM

Entering ETIS

The ETIS resides on a Pyramid 90X computer and is an umbrella structure housing numerous environmental information and analysis systems, all accessed through a menu. To enter ETIS, you will need a login and password obtainable from the ETIS project (see page 46 for information and accounts). The soils system is available through the main menu, or through the misc (miscellaneous) system menu.

Throughout this manual, commands are underlined for easier identification. In practice, do not underline commands.

If your login locates you in your home directory at UNIX command level, at the $ prompt type etis and press the carriage return to enter the ETIS menu. (UNIX is the operating system currently running on the University of Illinois Pyramid.) At this point, you should receive the ETIS herald message, as follows:

ETIS (Trademark applied for)

United States Army Corps of Engineers
Environmental Technical Information System

ETIS: What Program? (Type <cr> to see list):

At this point, you can enter the soils programs simply by typing soils, then pressing the carriage return (cr).

Inside The Soils System

Once in the soils system, you can press the carriage return to see the following soils system menu:

Type	For
1 or sirs	Soils-5 Interpretations Retrieval System.
2 or lpsirs	LP Soils-5 Interpretations Retrieval System.
3 or mpss	Multiple Parameter Series Search.
4 or muufs	Map Unit Use File Search.
5 or cales	Computer-Aided Land Evaluation System.
6 or rubouts	Ignore extraneous phone noise.
7 or end or bye	Exit from the Soils Systems module.

Any of the soils programs can be entered by typing either the program name or assigned number (new soils information systems will be added to this soils system menu as they become available). It is also possible to enter some soils programs from inside others; e.g., SIRS can be entered from inside MPSS or MUUFS.

The command 7, end, or bye will return you to the misc or the main ETIS menu level, depending on the route of entry. From there, you can either enter another ETIS program, use one of the other facilities on the Pyramid computer (such as mail), or log off the system.

5 SIRS and LPSIRS (Soils Information Retrieval Systems)

The Soils Information Retrieval System provides interactive retrieval of soil series data, based on user input of series name or record number. The data base is compiled from the SOI-5 data. The two retrieval systems, SIRS and LPSIRS, access the same SOI-5 data, but differ in the format of output tables. SIRS tables are 80 columns wide. LPSIRS creates tables that are 132 columns wide.

To enter SIRS or LPSIRS, select either option from the soil program menu. You can also enter SIRS from MUUFS or MPSS by invoking the SIRS command from within those programs. When entering SIRS from MPSS or MUUFS, you are allowed to submit a list of qualifying soils from a search. This procedure is illustrated in the MPSS example output (Appendix A) and in the MUUFS example output (Appendix B).

When you enter SIRS or LPSIRS directly from the soil program menu, begin by selecting a desired list of soil series names or record numbers at the computer prompt. Information in these systems is organized only by soil series, not by map units. The systems cannot retrieve information by soil complex, association, or any other soil mapping or taxonomic unit. You can request up to 100 series records to initiate a single retrieval session, although in SIRS it may be more efficient to conduct multiple sessions with fewer soils per session.

Some series have multiple SOI-5 records. Such series have more than one record number, and each specific record can be accessed by selecting that specific record number, if known. If you request a series that has more than one record number, the system will list all of the available record numbers for that series and ask you to choose one or more of these numbers. This choice may be confusing, as this listing of numbers does not always indicate what properties may differ between these separate record numbers. However, if there is a qualifying modifier (such as stony or flooded) it will be identified. If in doubt, choose all of the records available for that particular series.

SIRS Usage

Once the selection process is complete, identify the data of interest for each of the soils in the session. All of the data output is in table format. Your input is simply a matter of selecting items from table menus. The tables available in the main option menu are indicated in Table 1.

If table 0, 2, 3, or 5 through 9 is selected, the information is displayed for each of the soil records in the session. Then the screen returns to the main option table. If table option 1 or 4 is chosen, however, a second table option is presented. Items of interest must be selected from this table for each series in the session, one at a time. To display a list or menu of information available in table option 1 or 4, type list or the letter l. Table 2 shows the menu for option 1 and Table 3 shows the menu for option 4.

The command end, quit, or done exits either menu and returns to the main table option level, where choice 10 (terminate table selection) returns the screen to the series selection level. At this level, if no further choices are made and you press the carriage return key, the SIRS program is terminated. Operation of the SIRS system is illustrated in Appendix C, page 59.

Table 1

Main Options Table (SIRS)

Table	For Table or Listing
0	brief soil description
1	soil properties (selection table)
2	additional properties not in 1 or 3
3	flooding and high water table
4	use interpretation (selection table)
5	capability
6	woodland suitability
7	windbreaks
8	wildlife habitat suitability
9	potential native plants
10	to terminate table selection

Table 2

Soil Properties (SIRS)

Table	For Table Showing
0	no changes from previous choice(s)
1	texture
2	unified
3	aashto
4	organic matter
5	fraction > 3 in.
6	liquid limit
7	plasticity index
8	clay % < 2 mm
9	permeability
10	available water
11	erosion factors
12	moist bulk density
13	soil reaction
14	salinity
15	shrink swell
16	wind erodibility group
17	% material < 3" passing sieve #
all	all of the above tables

Table 3

Use Interpretations (SIRS)

Table	For Tables Showing
1	sanitary facilities
2	community development
3	resource materials
4	water management
5	recreation
all	all of the above tables

Differences Between SIRS and LPSIRS

In addition to the difference in the number of columns in table output, there are a few other distinctions between SIRS and LPSIRS. Perhaps the most important difference is that LPSIRS has an "all" option, while SIRS does not. That is, at the main table option level in LPSIRS, you can select and retrieve all of the information in the series record file for all of the series records selected for a particular session. If you want all of the information from a soils record, LPSIRS is more efficient, as it requires fewer inputs to obtain this information. When numerous records are accessed in a single session, the "all" option in LPSIRS can be especially useful. However, LPSIRS should only be chosen if you have a 132-column output device.

Another difference between the two information retrieval systems is that SIRS has subtable options for properties and interpretations, while LPSIRS automatically provides all properties and interpretations for all soils in a session. In SIRS, you select, for each soil in a session, the properties and interpretations of interest. This difference reflects the major functional separation between the two systems. SIRS is more efficient if you want to obtain selected items from the soils record(s), LPSIRS is more efficient if you want to obtain a dump of the entire record(s).

One other difference between the two systems is that help prompts are available in SIRS for options 1 and 4, while only a single help prompt is available in LPSIRS after the series selection process.

The final difference is in the exit procedure. To exit SIRS (or to initiate a new session), select option 10 at the main option level. To exit LPSIRS, simply press the carriage return at the main option level, rather than selecting a table option number.

6 MPSS (Multiple Parameter Series Search)

System

MPSS allows you to rapidly search the SOI-5 data base with combinations of criteria.

The criteria used as parameters are:

1. Soil properties (such as permeability or depth to watertable)
2. Soil interpretations (such as land capability class or crop yield)
3. Geographic areas (either states or major land resource areas)
4. Taxonomic codes (suborder, great groups, subgroups, or family criteria).

You can search for a single parameter or multiple parameters at the same time. You can further limit or expand a search by using the expressions "and" and "or" in your query. The result of the search is the number of soil interpretations records that meet the search criteria. These soil records may then be listed and passed on to SIRS for a more detailed view of each soil interpretations record, or be used in conjunction with the MUUF data base to determine acreage by county, state, or MLRA.

Commands

A command entered at the prompt "MPSS :" tells the system what operation to perform on the data. A search is initiated using a command line which contains a command, a key, and a class of the key, for example: find state va. Other kinds of command lines may be used and are described below. The command lines are underlined for easier identification. In practice, do not underline commands.

MPSS: help Provides help on how to proceed.
MPSS: command or commands Gets a listing of all the commands with some rules as to their usage.
MPSS: key or keys Gets a list of all the permissible keys.
MPSS: find or f Begins a search. Every search must begin with a command line containing find or f, a key, and a class of a key (keys and classes are discussed in the next section).
MPSS: and Limits a previous search by selecting only those records that are common to the original search and the new search.
MPSS: or Expands a previous search by accumulating the soils that appear in either the previous search or the current one.
MPSS: < or > Searches all soil records greater than or less than the class value that follows the command. The results include the class interval that the class value lies in.
MPSS: save Saves a copy of the current record (after execution of all previous commands) in a place called "stash" (can later be used with and or or).
MPSS: history or h Gives a history of all the command lines. The list begins with the line containing the last find command. Command lines with help, key(s), or command(s), and lines listing the classes of a key will not appear.

MPSS: ccl Gives a history of all the command lines that have only find, and, and or as commands. As with history, the list will begin with the last command line containing find as a command.

MPSS: sh Lists the command lines that created the current saved record.

MPSS: oops or backup Goes back one command line from the current position. To go back more than one command line, follow either of these commands by a number. For example, oops 3 will back up three command lines. The lines involved must have commands that caused some changes to be made to the current record. A listing of those command lines may be obtained by using ccl as discussed previously.

MPSS: sirs Presents a more detailed display of a soil interpretations record or a set of soil interpretations records. This is done by passing the line numbers assigned to each soil interpretations record from MPSS to SIRS. A range of numbers is permissible; separate the lowest from the highest by a '-' character. Once this is done, you will enter the SIRS system. After leaving the SIRS system, you will be prompted again for more line numbers. If you are done, press carriage return to leave this process. All the lines may be selected by typing "all" at the prompt. Also, the MPSS command list or l may be invoked to see the soil interpretations record list again.

MPSS: list or l Gives a listing of all the soil interpretations records found in the search. Each record is preceded by a line number which may be used as a reference in case you want to invoke SIRS. The list command can also be used to see all the class values pertaining to a particular key by following it with the name of that key, e.g., list awc.

MPSS: show After running a search, use this command to break down the resulting soil records into class intervals of any class.

MPSS: freq After running a search, use this command to output the number of records, the percent of the total, and the cumulative percent for each class interval.

MPSS: comuuf (county map unit use file)* Gives the total acreage for each county that the soil interpretations records appear in.

MPSS: stmuuf (state map unit use file)** Gives the total acreage for each state that the soil interpretations records appear in.

MPSS: lramuuf (mlra map unit use file)*** Gives the total acreage for each MLRA that the soil interpretations records appear in.

MPSS: bye, done, q, or quit, or hold down the control key and type d Leaves the system.

Keys and Classes

A key is any property, geographic region, soil interpretation, or taxonomic code that can be searched. Each key is divided into classes; for example, the key ph is divided

*comuuf (county map unit use file): Gives two table options: (1) a list of acreages for each soil record, by the counties they occur in or (2) a list of acreages for each county, by the individual soil records that occur in them.

**stumuuf (state map unit use file): Works in same manner as comuuf, only at the state level.

***lramuuf (mlra map unit use file): Works in same manner as comuuf, only at the mlra level.

into seven classes. The key informs the system which set of soil interpretations records to retrieve for the operation, and the class specifies which record from this set to use.

Table 4 is a list of keys used in the MPSS system. You can get the same list while in the system by entering the command keys.

Appendix F, beginning on page 75, is a list of classes for most of the keys. Some of the classes are so large that they are not available on the screen. You will need to check the reference listed on the screen (or following the key in Appendix F). You can list the class subdivisions by entering at the prompt list <key> or simply l <key>, for example, l ph. An example MPSS session is illustrated in Appendix A on page 48. A session illustrating the use of taxonomic codes is also given in Appendix A.

Since some soils have more than one class value for a specific depth increment, care must be taken in interpreting the MPSS output. For example, when searching for sandy, acid soils in New York that have a low organic matter, the soil Freetown is called up. Freetown is an organic soil, but the organic matter in the surface layer can vary. An example search follows.

MPSS: f ph <4 and om <4 and textsur s

class interval : >= 4.50 but < 5.60

346 Soil Interpretation Records (SOI-5's) found

class interval : >= 5.00 but < 20.00

98 Soil Interpretation Records (SOI-5's) found

class : s, cos, fs, vfs

26 Soil Interpretation Records (SOI-5's) found

MPSS: and instate ny
2 Soil Interpretation Records (SOI-5's) found

MPSS: l

line no.	series (record no.)	line no.	series (record no.)
1	freetown (ma0074)	2	atsion (nj0015)

MPSS: sirs

Select series to be passed on to SIRS
List Number (from listing -- CR to leave)

: 1

SOILS-5 INTERPRETATIONS RETRIEVAL SYSTEM

Table option (CR for choices): 0

freetown (ma0074)

mlra(s): 144a, 145, 149b
khl, 1-79
typic medisaprists, dysic, mesic
The freetown series consists of deep, very poorly drained organic soils that formed in more than 51 inches of highly decomposed organic material. These soils are in bogs that are on lake plains, outwash plains, till plains and moraines. Typically they have a dark reddish brown muck surface layer about 2 inches thick over black and dark reddish brown muck to a depth of 60 inches. Slopes range from 0 to 1 percent.

Table option (CR for choices): 1
---- Type 'list' or 'l' for a table list. Type help for help.----
---- 1 series available for this session ----

Current Series: freetown (ma0074)

Table entries (type CR if done)
:: 4

Unit Name: freetown (ma0074)

depth (in)	organic matter (pct)
0-5	1-2
0-5	>50
5-60	

As the example shows, the depth increment 0-5 in. has two organic matter percent values, 1-2 and >50. Because this is the way the data is structured for some soil records, the user may want to check for double values by entering SIRS, as in the example, or by using the show or freq commands in MPSS.

Table 4

Keys used in MPSS

Type	For
aashto	engineering classification at 25"
awc	available water capacity (total to 40")
bd	bulk density (maximum within 40")
brdepth	depth to bedrock
brhrdns	bedrock hardness
clay25	percent clay at 25" depth
claysur	percent clay in surface layer
corrconc	corrosivity, concrete
corrstl	corrosivity, steel
cpdepth	depth to cemented pan
cpthns	thinness of cemented pan

Table 4 (Cont'd)

crops	Used with list to give a list of permissible crops, e.g., l crops. Use the crop name for a search key, e.g., f corn 120. Type l <crop name> for crop yield intervals. NOTE : non-irrigated is assumed unless that data is not available, in which case, irrigated data is used.
flooddu	flooding duration
floodfr	flooding frequency
floodmo	flooding month
fract	fraction > 3 inches (surface layer)
frost	potential frost action
ggrp	great group (see Appendix D for taxonomic codes)
hgrp	hydrologic group
instate	state in which a series is used
k	K factor (USLE)
lcc	land capability class
ll	liquid limit at 25" depth
min	mineralogy (see Appendix D for taxonomic codes)
mlra	major land resource area (see mlra map, Appendix E)
om	organic matter at surface layer
other	other family criteria (see Appendix D for taxonomic codes)
partsz	particle size family (see Appendix F for taxonomic codes)
perm	permeability (minimum within 40")
ph	ph (surface layer)
ph40	ph (minimum lower value within 40")
pi	plasticity index at 25"
react	reaction (see Appendix D for taxonomic codes)
salt	salinity (maximum within 40")
shsw	shrink swell (maximum within 40")
soil	series - either by record number or the series name (enclosed in quotes if more than one word)
state	state having responsibility for the series
stemp	soil temperature (see Appendix D for taxonomic codes)
subg	subgroup modifier (see Appendix D for taxonomic codes)
subor	suborder (see Appendix D for taxonomic codes)
sve4	% passing sieve 4 (at 25" depth)
sve10	% passing sieve 10 (at 25" depth)
sve40	% passing sieve 40 (at 25" depth)
sve200	% passing sieve 200 (at 25" depth)
t	T factor in surface layer (USLE)
text25	texture class at 25" depth
textsur	surface texture and/or modifier
totlsub	total subsidence
unified	unified classification at 25" depth
weg	eind erodibility group (surface)
wtdepth	depth of high water table
wtkind	water table kind

7 MUUFS (Map Unit Use File)

System

MUUFS runs much like the MPSS except the result of this search is a list of mapping units (not soil interpretations records) which fit the search criteria. With this list, a table of items related to it may be shown on request.

A command line may appear in three different forms, depending on the commands used. One consists of a command followed by a specified keyword and a class value which is a categorical breakdown of the keyword, e.g., f floodfr c. Another is a command followed by a keyword or number, e.g., list prime (this gives you a breakdown of the classes pertaining to the keyword prime). Lastly, a command appears as the only entry in the line, e.g., Keys (gives a list of keys). Command lines may be placed one after another in a single line to form a set of command lines.

In what follows, the commands and keywords are underlined for easier identification. In practice, do not underline commands.

Commands

MUUFS: help Provides help on how to proceed.
MUUFS: commands or command Gets a listing of all the commands with some rules as to their usage.
MUUFS: keys or key Gets a list of all permissible keys.
MUUFS: find or f Begins a search. Every search must begin with a command line containing find or f, a key, and a class of a key (keys and classes are discussed in the next section).
MUUFS: and Limits a previous search by selecting only those records that are common to the original search and the new search.
MUUFS: or Expands a previous search by accumulating the records that appear in either the previous search or the current one.
MUUFS: save Saves a copy of the current record (after execution of all previous commands) in a place called "stash" (can later be used with and or or).
MUUFS: history or h Gives a history of all the command lines. The list begins with the line containing the last find command. Command lines with help, key(s), command(s), and lines listing the classes of a key will not appear.
MUUFS: ccl Gives a history of all the command lines that have only find, and, and or as commands. As with history, the list will begin with the last command line containing find as a command.
MUUFS: sh Lists of command lines that created the current saved record.
MUUFS: list or l Gives a listing of all the map units found in the search. Each map unit is preceded by a line number which may be used as a reference in case you want to invoke SIRS. To see all the classes pertaining to a particular key, follow this command with the name of that key.
MUUFS: sirs Allows user to access the SIRS system. No information is passed as in the MPSS system.
MUUFS: mpss Allows user to access the MPSS system.
MUUFS: oops or backup Goes back one command line from the current position. To go back more than one command line, follow either of these commands by a number. For example, oops 3 will back up three command lines. The commands invoked must have commands that caused some changes to be made

to the current record. A listing of those command lines may be obtained by using ccl as discussed previously.

MUUFS: bye, done, q or quit, or hold down the control key and type d. Leave the system.

Keys and Classes

In a command line, the command tells the system what operation to perform on a record. The key informs the system which set of records to retrieve for the above operation and the class specifies which record from this set to use. Table 5 is a list of keys used in MUUFS. You can get the same list while in the system by entering the command keys. Note that the values associated with each key may be anything from a maximum, minimum, mean number to a character string. Appendix G on page 81 is a list of classes of MUFFS keys. Appendix B, on page 56 is an example of a MUUFS session.

Table 5

Keys used in MUUFS

Type	For
county	map units in a county
state	map units in a state
mlra	map units major land resource area (see mlra map in Appendix E on page 73)
mapkind	*kind of soil map unit*
prime	prime farmland code
ssa	survey area number, including state FIPS
muacres	acres of a map unit
floodfr	flooding frequency
kcomp	kind of components
slope	slope
corryear	correlation year for a survey area
usdatext	surface texture
ocriteria	other phase criteria

8 CALES (Computer-Aided Land Evaluation System)

Background

The Computer-Aided Land Evaluation System (CALES) is an outgrowth of two SCS activities, the Soil Potential Ratings system and the Agricultural Land Evaluation and Site Assessment (LESA) system. Both of these systems are designed to determine the relative quality of land for agricultural uses including the economic viability. The CALES program does not include the site assessment part of LESA. Additional information is available in the Land Evaluation section of the LESA Handbook[1] and the Soil Potential section of the *National Soils Handbook.*[2]

In agricultural land evaluation, soils are rated from the best to the worst, for a specific agricultural use, based on an indicator crop. A relative value is determined for each group based on the cost of overcoming production limitations. The group with the highest relative value, the best for agricultural use, is assigned a value of 100 and all other groups are assigned lower values. The land evaluation is based on soils data from the National Cooperative Soil Survey, local conservation practice and economic information. The county soil survey must be entered into the Map Unit Use File (MUUF) for this program to work.

CALES runs by creating two different worksheets. Worksheet 1 is a list of soils from the Map Unit Use File that is sorted by land capability class. This worksheet can then be manipulated using editors. Worksheet 2 is created by grouping the soils in worksheet 1 into agricultural groups.

This computer-assisted procedure follows the same steps that appear in the LESA Handbook once login procedures are completed. The steps are listed below:

Getting Help

The first time through, you may wish to enter the help command to get some hints on how to proceed. Most of the more complicated commands will have this capability.

CALES: help Provides additional information on how to proceed.Help is available at the "command" prompt. More detailed help is available inside each of the following commands: ced, led, append, adj and group. These commands will be explained later.

***** EXAMPLE OF help FROM THE COMMAND LEVEL *****

command : help

command	function
list	list the contents of worksheet 1
l	same as "list"
oldlist	show the old or original list

[1] *National Agricultural Land Evaluation and Site Assessment Handbook* (Soil Conservation Service, 1983).

[2] *National Soils Handbook* (Soil Conservation Service, 1983).

oldl	same as "oldlist"
delete	delete certain lines from worksheet 1
d	same as "delete"
undo	undo previous commands and go back to the original worksheet 1
u	same as "undo"
append	add new lines to worksheet 1
ced	edit the current state criteria record
led	make specific changes to a designated set of lines
adj	enter data for adjustment of yields and calculate the adjusted productivity index
save	save a copy of the current work on disk and overwrite what's already there
restore	bring the saved copy out to work on and overwrite what's already there
group	grouping for worksheet 2
sort	sort worksheet 1 with respect to LCC
w2	see worksheet 2 and grouping breakdown
done	start a new worksheet 1 session
q	to exit from an edit session

bye, quit, or control-d to leave the system

Typical sequence of commands :

1. ced -- Make changes inside the criteria editor.

WHILE INSIDE, when done, type an 'a' at the prompt :: to apply the criteria data to the listing. Type a 'q' to leave.

2. adj -- Enter or make changes to adjustment of yield data.

Same direction as above.

3. group -- do the grouping
4. w2 -- resulting tables from grouping

To see the listing just produced, enter the command list or l at the prompt.

***** END EXAMPLE *****

Worksheet 1

Preliminary List Of Soils

This part of the program creates a list of soils from the Map Unit Use File (MUUF) and sorts the soils by land capability class in ascending order. You will be prompted for each of the following mandatory initial input items.

Restore. If you have previously saved a file, the first prompt will ask if you would like to restore data from your previously saved file. Type yes or no (or y or n).

County. Enter the county name and state abbreviation, using either upper or lower case letters (e.g., Autauga, AL) or the soil survey area code (e.g., 17604). These codes are listed in CASPUSS and MUUF (soil scientists can help you find these codes). If you typed y to restore a previously saved file, you must now enter the name or number of the saved file (you may save more than one file). For soil survey areas with two or more counties, the name for each county must be used.

Indicator Crop. Input the indicator crop name. The spelling is quite precise, so you may want to press the carriage return key to see a permissible list of names. If there are enough user requests, future versions may use a number in place of the crop name.

Temperature Regime. Input the appropriate temperature regime. Press the carriage return key for a listing.

C Factor. Enter a single integer from 1 to 200 representing the annual wind erosion climatic factor for your location. If wind erosion is not a problem in your area, enter a small number such as 5.

Irrigated? If irrigated, enter the letter y. Otherwise enter the letter n.

Listing and Saving

After the mandatory data is input, the computer asks you to wait while it applies the information and puts it into table format. A message will appear indicating the CALES listing is ready and you will receive a command line and a colon prompt ":" at the left margin. You may now enter a command to continue. If a message appears that "the records are not available" it may be because the SOI-5 record numbers were not placed in the SOI-6 data base or that the MUUF file has not been updated recently.

Check the list to see that it includes all the map units, that the acreages match, and that the yields and land capabilities are correct for the county. The data are from the SOI-5 and SOI-6 and may have been subsequently modified from the published soil survey.

***** EXAMPLE OF WORKSHEET 1 USING THE list COMMAND *****

```
$ /scs/sys/cales
/scs/sys/cales

Computer-Aided Land Evaluation System (Version as of April, 1986)

Call Lynn Engelman, 217-333-1369 with any problems

Latest update, November 1986 - 183,299 mapping units

   County name or FIPS : Westmoreland,va

   indicator crop (CR for list) : corn

   temperature regime (CR for list) : mesic

   C factor ( % (1-200) from most susceptible month ) : 5

   is this system irrigated ( y or n )? : n
   please wait

   Your LESA listing is ready. *** Type done to start over ***
```

command : list

County: Westmoreland, Virginia

Indicator crop: corn
Temperature Regime: mesic C factor: 0.05
System irrigated? no

line no.	map symb	soil name	slope	nirr prd i lc yield ind f	acres	numberpct
1	10	lumbee	0 - 2	0 2	9,531	5.8
2	14	pits	0 -	0 0	329	0.2

.
.
(etc)

***** END EXAMPLE *****

You are encouraged to use the save command frequently so you won't have to repeat your work if you exit from the system unexpectedly. Currently, this command saves a copy of the initial input and listings in a file on disk. Note that whatever is already there will be erased and will be replaced by the most current work. Future versions will include a provision to save the results of each county.

Adding and Deleting Soils

If you need to add map units to the list, use the append command. The order of entry is provided by a header. Every data item is in the same order as that appearing in worksheet 1 except for the series name. Type q to quit the append editor.

***** EXAMPLE OF help FROM append COMMAND *****

command: append

Enter a '-' in places where there is no available data

line	map	slope			prime		
no	symbol	ls us	lcc	yield	(0-7)	acres	soil series
36	help						

After each line number enter eight data items according to these rules:

--if there is no data for a particular item, enter a '-'
--DO NOT enter any commas for acres
--do not separate the lower slope (ls) and the upper slope (us) with a '-'
--the soil name is purposely last for design reasons

prime:

type	for
0	not prime

1 all areas prime
2 only drained areas
3 only areas protected from flooding or not frequently flooded during the growing season
4 only irrigated areas
5 only drained areas that are either protected from flooding or not frequently flooded during the growing season
6 only irrigated areas that are drained
7 only irrigated areas that are either protected from flooding or not frequently flooded during the growing season
36 q

***** END EXAMPLE *****

***** EXAMPLE OF AN append COMMAND SESSION *****

command : append
Enter a '-' in places where there is no available data

line no	map symbol	slope ls	us	lcc	yield	prime (0-7)	acres	soil series
35	15	0	1	8w	0	0	757	rappahannock
36	q							

***** END EXAMPLE *****

If you need to delete map units from worksheet 1 use the delete or d command. You will be prompted for the line(s) that is (are) to be deleted. When specifying the lines that are to be deleted, separate a range of lines with a '-'. Use a blank space to separate individual line numbers. All lines to be deleted should be entered at the same time since all lines below deleted lines will move up and replace deleted lines. Type q to leave the delete editor.

***** EXAMPLE OF help FROM delete COMMAND *****

command : delete

lines to be deleted : help
Enter all possible line numbers in a row separated by blank spaces. Continuous line numbers may be written with the lower value separated from the upper value by a '-'.

Examples :

10	3	14	15	16	17	18	will delete line 3, 10, and 14-18
10	3	14-18					same result as above

***** END EXAMPLE *****

Correcting Data on a Line

When you have made sure all the soils are listed, check "lcc" (land capability classification), "nirr yield" (nonirrigated), and "if" (important farmland) to make sure they are represented properly. If not, they can be changed using one of two different editors: the line editor (led) or the criteria editor (ced). All soil mapping units should have a land capability class and subclass entered; if omitted, these units will be listed and sorted first on all outputs.

If there are lines in worksheet 1 containing data items that you wish to change, invoke the led command. Remember that any data item changed will be done for all the lines designated. This is one of the most important commands in the system. If a mistake is made or unwanted data are entered while using one of the other commands, use this command to make corrections. Always use the save command after changing lines to save your changes and write them to worksheet 1.

***** EXAMPLE OF help FROM led COMMAND *****

command : led

To change slope(s), lcc(1), yield(y), important farmland(f), and acres(a) type done or 'q' at the prompt to leave
line(s) to change : help

At the prompt, enter the lines that are to be changed. Ranges may be separated by a '-'.

example :

line(s) to change : 10-15 2 50

The above is a request for lines 10, 11, 12, 13, 14, 15, 2, and 50 to be changed.

Type 'disp' to see the contents of the previously selected set of lines.

***** END EXAMPLE *****

Any or all five data items in each line may be changed. Precede each with a letter so the system can determine which data item to alter. For the slope, the lower must be separated from the upper by a '-'. No commas are allowed. Only blanks may be used as separators.

data item	letter preceding
slope	s
land capability class	l
yield	y
important farmland	f
acres	a

Permissible entries for important farmland are p, s, L, and o (p-prime, s-statewide, L-local, and o-others, followed by 0-7.

change(s) : s 11-22 y50 a 2000

The above will change the lower slope to 11 and the upper to 22, the yield to 50, and the acres to 2000. The land capability class and the important farmland items will remain unchanged.

changes(s) : f L l 7w y 2000

The above will change important farmland to local, land capability class to 7w and yield to 2000 with the other parameters unchanged.

***** EXAMPLE OF LINE EDITOR (led) SESSION *****

command : led
To change slope(s), lcc(l), yield(y), important farmland(f), and acres(a) type done or 'q' at the prompt to leave
line(s) to change : 1

change(s) : 1 8w

changes completed

line(s) to change : 2
change(s) : 1 3w y 100

changes completed

line(s) to change : q

***** END EXAMPLE *****

After making changes that would destroy the ascending order of the land capability classification, invoke the sort command to sort worksheet 1 to put land classes in the correct order. This is also a good time to save worksheet 1.

Another way to make changes in the important farmland designations and apply them to your list is to use the criteria editor (ced).

This line editor allows you to list a specific line, change a line, write the results into a disk file, and to apply the data to alter the important farmland symbol. Each of the commands to carry out these tasks consists of a single character followed by a carriage return. Help is available for this editor.

***** EXAMPLE OF help FROM ced COMMAND *****

command : ced

*** Line editor for entering criteria data ***

:: help

command	function
#	show the line corresponding to this number NOTE: # stands for a number to be entered
-	go back 1 line
CR	go forward 1 line with a carriage return
.	print the current line
p	print all the lines in this editor

c	want to change the current line
#c	change line #
c#	same as above
a	apply the results of the editor
w	write the record permanently to disk
q	exit from the edit session

For each line, there are two possible data items, one for state and one for local. Precede each with a 's' if it is a state data and 'l' if a local data. Enter one or both on each change. The order of entry is not important.
For land capability subclass, you may enter a single class or a range of subclasses separating the lower and upper with a '-' only. No other separators will be accepted. The order of the classes from low to high are:

1, 2e, 2c, 2w, 2s, 3e, 3c, 3w, 3s, 4e, 4c, 4w, 4s,
5w, 5s, 6e, 6c, 6w, 6s, 7e, 7c, 7w, 7s
8e, 8c, 8w, 8s, 8
example : 2s-3c sets the range for 2s, 3e, 3c

:: q

***** END EXAMPLE *****

The criteria editor allows you to determine lands of statewide and local importance and to limit the prime farmland criteria to the conditions approved by the State Conservationist. The criteria available for defining important farmland are:

1	AWC within 40 in. (mean value)
2	depth to pan or rock
3	K x slope is less than
4	I x C does not exceed
5	perm., fastest within 20 in.
6	rock fragment > 3 in.
7	slope limit
8	flooding freq. (n, r, o, f)
9	land capability class (xx-yy)
10	eroded phase excl? (y or n)
11	sev erod phase excl? (y or n)

This criteria should be determined by each state according to their limitations for state and local farmland. Use the criteria editor to insert your state and local data and be sure to write it to the disk using a "w" command so that it can be applied to all counties.

The first seven variables require a numerical entry. The last four variables apply only to flooding frequency and land capability classes and require a character or combination of characters.

There are 11 lines in the criteria editor. The following commands will help you list a line so you can check the data.

Command	Means
3	go to line 3 and print it
cr	print the next line

-	go back one line and print it
---	go back 3 lines and print that line
.	print the current line, the line you are at now

Use the following inputs to tell the system what line to change.

Command	Means
2c	want to change the contents of line number 2
c2	same as above
c	want to change the line you are at now

For each line, there are two possible data slots, one for the state criteria and one for local. You may change one or both data items, but you must precede each with the letter "s" (if state data) or "l" (if local data) so the editor can distinguish the data. The order of each entry is not important. Be sure to separate each data item with blank spaces if you change both. Some examples follow.

Entry	Means
l.4.3	for that line, change the local data to 4.3
s y	change state data to a letter y
l 2.1 s3.6	change local to 2.1 and state to 3.6
s1-2w l3s	change state to 1-2w and local to 3s

The latter example is for land capability class. Note that if you wish to enter a range, the lower and upper ranges must be separated by a '-' only; no other separators are allowed.

When you are satisfied with the criteria, save them by writing to disk, apply them to the list of soils, and leave the criteria editor by using the following commands:

:: w write the results permanently to disk, erasing what's there (each state is allowed one copy)
:: a apply the data to alter the farmland symbols
:: q leave the criteria editor

***** EXAMPLE OF CRITERIA EDITING (ced) SESSION *****

```
command : ced

*** Line editor for entering criteria data ***

:: p [for print all lines]
   1  -- AWC within 40 in. (mean value)      :  s   0.0   l   0.0
   2  -- depth to pan or rock                :  s   0.0   l   0.0
   3  -- K x slope is less than              :  s   0.0   l   0.0
   4  -- I x C does not exceed               :  s   0.0   l   0.0
   5  -- perm., fastest within 20 in.        :  s   0.0   l   0.0
   6  -- rock fragment > 3 in.               :  s   0.0   l   0.0
   7  -- slope limit                         :  s   5.0   15.0
   8  -- flooding freq. (n, r, o, f)         :  s:nro      l:nro
   9  -- land capability class (xx-yy)       :  s:2e-3s    l:4e-4s
```

```
   10  -- eroded phase excl? (y or n)          :  s:n      l:
   11  -- sev erod phase excl? (y or n)        :  s:y      l:n

:: c7
new data (precede each item with s or l) : s 15  1 25

:: .
 7 -- slope limit : s 15  1 25

:: w
record is written

:: a
Criteria data has been applied

:: q
```

***** END EXAMPLE *****

Adjusting Yields for Cost of Conservation

Automated Adjustments

The yield must be adjusted to account for the costs of conservation treatment needed to overcome soil limitations. The adjustment is made by subtracting the yield equivalent of the cost of treatment from the yield. Much of the work is done for you in the ADJustment editor. Help is available for this task.

***** EXAMPLE OF help FROM adj COMMAND *****

```
command : adj

*** Line editor for entering adjustment data ***

:: help
```

command	function
#	show the line corresponding to this number NOTE: # stands for a number to be entered
-	go back 1 line
CR	go forward 1 line with a carriage return
.	print the current line
p	print all the lines in this editor
c	want to change the current line
#c	change line #
c#	same as above
a	apply the results of the editor
q	exit from the edit session

For lines to be applied to, enter single numbers separated by commas or blank spaces, and ranges separated by a '-'.

example : 10 3 14-20 apply adjustment data to lines 10, 3, 14, 15, 16, 17, 18, 19, and 20

***** END EXAMPLE *****

The ten factors used to make the adjustments are:

1 type of limitations (e, w, s, c)
2 conservation measure code(s) - up to three (you can see a list of 119 measures by hitting carriage return at the prompt for new data)
3 amount of conservation measure/acre (the system will use the unit of measure in the measure code list)
4 installation cost of conservation measure in dollars (per unit of measure listed in 2 above)
5 life span (year(s))
6 annual maintenance cost in dollars (per unit of measure listed in 2 above)
7 land lost to installation (% of ave. yield (0-100))
8 interest rate (0-100)
9 price for unit of indicator crop in dollars
10 lines in list to be applied to

Except for the type of limitations, which requires characters, all entries are numerical. Note that for land lost to installation, the percent must be an integer value and not the decimal equivalent.

Information needed for completing the above 10 factors is available in the SCS field office technical guide. The adjustment editor is similar to the criteria editor with the following exceptions:

- the w (write) command does not apply here
- there is only one entry per line (usually numerical) and there is no need to precede each data item by a letter
- for lines to be applied to, ranges must be separated by a '-' as in land capability class in the criteria editor, but blank spaces and commas may be used as separators

After you've made the adjustments, the system will calculate the soil potential for the indicator crop.

***** EXAMPLE OF AN adj SESSION *****

```
command : adj

*** Line editor for entering adjustment data ***

        :: (cr)
        1 -- type of limitations ( e, w, s, c ) :
        :: c
        new data : w

        :: (cr)
```

2 -- conservation measure code :
:: c

new data (CR for long list) : cr

type no.	for code	name (unit)
1	560	access road (ft)
2	310	bedding (acre)
3	314	brush management (acre)
4	322	channel vegetation (acre)
5	324	chiseling and snagging (acre)
6	326	clearing and snagging (acre)
7	397	commercial fishponds (acre)
8	328	conservation cropping system (acre)
9	329	conservation tillage system (acre)
10	330	contour farming (acre)
11	331	contour orchard and other fruit area (acre)
12	340	cover and green manure crop (acre)
13	342	critical area planting (acre)
14	344	crop residue use (acre)
15	348	dam diversion (no.)
16	402	dam, floodwater retarding (no. and acre-ft)
17	349	dam, multiple-purpose (no. and acre-ft)
18	352	deferred grazing (acre)
19	356	dike (ft)
20	362	diversion (ft)
21	365	emergency tillage (acre)
22	380	farmstead and feedlot windbreak (acre)
23	382	fencing (ft)
24	386	field border (ft)
25	392	field windbreak (ft)
26	393	filter strip (acre)
27	394	firebreak (ft)
28	398	fish raceway (ft)
29	395	fish stream improvement (ft)
30	399	fishpond management (no.)
31	400	floodwater diversion (ft)
32	404	floodway (ft)
33	410	grade stabilization structure (no.)
34	412	grassed waterway or outlet (acre)
35	411	grasses and legumes in rotation (acre)
36	548	grazing land mechanical treatment (acre)
37	561	heavy use area protection (acre)
38	422	hedgerow planting (ft)
39	423	hillside ditch (ft)
40	320	irrigation canal or lateral (ft)
41	388	irrigation field ditch (ft)
42	464	irrigation land leveling (acre)
43	552	irrigation pit or regulating reservoir (no.)
44	436	irrigation storage reservoir (no. and acre- ft)
45	441	irrigation system - drip (no. and acre)
46	442	irrigation system - sprinkler (no. and acre)

47	443	irrigation system - surface and subsurface (no. and acre)
48	447	irrigation system, tailwater recovery (no.)
49	428	irrigation water conveyance-ditch and canal lining (ft)
50	430	irrigation water conveyance - pipeline (ft)
51	449	irrigation water management (acre)
52	460	land clearing (acre)
53	543	land reconstruction, abandoned mined land (acre)
54	544	land reconstruction, currently mined land (acre)
55	466	land smoothing (acre)
56	468	lined waterway or outlet (ft)
57	472	livestock exclusion (acre)
58	482	mole drain (ft)
59	484	mulching (acre)
60	500	obstruction removal (acre)
61	582	open channel (ft)
62	510	pasture and hayland management (acre)
63	512	pasture and hayland planting (acre)
64	516	pipeline (ft)
65	556	planned grazing systems (acre)
66	378	pond (no.)
67	521	pond sealing and lining
68	462	precision land forming
69	338	prescribed burning (acre)
70	528	proper grazing use (acre)
71	530	proper woodland grazing (acre)
72	532	pumped well drain (no.)
73	533	pumping plant for water control (no.)
74	550	range seeding (acre)
75	562	recreation area improvement (acre)
76	566	recreation land grading and shaping (acre)
77	568	recreation trail and walkway (ft)
78	554	regulating water in drainage systems (acre)
79	555	rock barrier (ft)
80	557	row arrangement (acre)
81	570	runoff management system (no. and acre)
82	350	sediment basin (no.)
83	572	spoil spreading (ft)
84	574	spring development (no.)
85	575	stock trails and walkways (ft)
86	580	streambank and shoreline protection (ft)
87	584	stream channel stabilization (ft)
88	585	stripcropping - contour (acre)
89	586	stripcropping - field (acre)
90	589	stripcropping - wind (acre)
91	587	structure for water control (no.)
92	588	stubble mulching (acre)
93	606	subsurface drain (ft)
94	607	surface drainage - field ditch (ft)
95	608	surface drainage - main or lateral (ft)
96	600	terrace (ft)
97	610	toxic salt reduction (acre)
98	612	tree planting (acre)
99	614	trough or tank (no.)
100	620	underground outlet (ft)

101	630	vertical drain (no.)
102	312	waste management system (no.)
103	425	waste storage pond (no.)
104	313	waste storage structure (no.)
105	359	waste treatment lagoon (no.)
106	633	waste utilization (acre)
107	636	water-harvesting catchment (no.)
108	638	water- and sediment-control basin (no.)
109	640	waterspreading (acre)
110	642	well (no.)
111	645	wildlife upland habitat management (acre)
112	648	wildlife watering facility (no.)
113	644	wildlife wetland habitat management (acre)
114	650	windbreak renovation (acre)
115	652	woodland direct seeding (acre)
116	654	woodland improved harvesting (acre)
117	666	woodland improvement (acre)
118	660	woodland pruning (acre)
119	490	woodland site preparation (acre)

new data (CR for long list) : 93

:: (cr)
3 -- amount of conservation measure/acre :
:: c
new data : 200

:: (cr)
4 -- installation cost of conservation measure ($) :
:: c
new data : 1

:: (cr)
5 -- life span (year(s)) :
:: c
new data : 20

:: (cr)
6 -- annual maintenance cost ($) :
:: c
new data : .05

:: (cr)
7 -- land lost to installation (% of ave. yield (0-100)) :
:: c
new data : 0

:: (cr)
8 -- interest rate (0-100) :
:: c
new data : 8.75

:: (cr)
9 -- price for unit of indicator crop ($) :

:: c
new data : 3

:: (cr)
10 -- lines in list to be applied to :
:: c
new data : 7-15

:: a

Calculated yield reduction is 10.41. The breakdown is :

10.00 maintenance
21.24 amortized annual value
0.00 land loss
31.24 <---- divide this by price [to get calculated yield reduction of 10.41]

Type in an alternate number at the prompt to change it. Otherwise type carriage return to continue adjustment or 'abort' to discontinue the process.
new number? (this is the number of units of the indicator crop to be decreased, not the number of dollars) (cr)

:: q

***** END EXAMPLE *****

Shortcut Adjustment Method

If you have already developed the cost of applying conservation systems to the soils in your area, you may go directly to line 10 of the adjustment editor and designate those lines for which that adjustment may be applied. Then enter "a" to apply and the calculated value will be "0". At the prompt for a new number, enter the number representing the reduction in yield to be made.

***** EXAMPLE OF SHORTCUT METHOD USING ALREADY *****
DEVELOPED ADJUSTMENT VALUES

command : adj

:: p

1 -- type of limitations (e, w, s, c) :
2 -- conservation measure code :
3 -- amount of conservation measure / acre :
4 -- installation cost of conservation measure ($) :
5 -- life span (year(s)) :
6 -- annual maintenance cost ($) :
7 -- land lost to installation (% of ave. yield (0-100)) :
8 -- interest rate (0-100) :
9 -- price for unit of indicator crop ($) :
10 -- lines in list to be applied to :

:: c 10
new data : 7-15

:: a

Calculated yield reduction is 0.00. The breakdown is :

0.00 maintenance
0.00 amortized annual value
0.00 land loss
0.00 <---- divide this by price

Type in an alternate number at the prompt to change it. Otherwise type carriage return to continue adjustment or 'abort' to discontinue the process.

new number? : 10
Adjusted yields have been calculated

:: q

***** END EXAMPLE *****

Worksheet 2

Grouping

Careful grouping of the soils into agricultural groups will result in the soils in group 1 having the highest weighted average yield. If the soils in group 1 are in capability class I, no adjustment of the weighted average yield is needed, because soils in capability class I have few or no limitations to use for cropland. The group command allows you to enter the criteria used to design worksheet 2.

*****EXAMPLE OF help AT THE group COMMAND *****

command : group

:: help

command	function
#	show the line corresponding to this number NOTE : # stands for a number to be entered
-	go back 1 line
CR	go forward 1 line with a carriage return
.	print the current line
c	want to change the current line
#c	change line #
c#	same as above

command	function
h	give the heading to show the order of data entry
w	write the record permanently to disk
q	exit from the edit session

For land capability class, you may enter a single class or a range of classes separating the lower and upper with a '-' only. No other separators will be accepted. The order of the classes from low to high are :

1, 2e, 2c, 2w, 2s, 3e, 3c, 3w, 3s, 4e, 4c, 4w, 4s,
5w, 5s, 6e, 6c, 6w, 6s, 7e, 7c, 7w, 7s
8e, 8c, 8w, 8s, 8

example : 2s-3c sets the range for 2s, 3e, 3c

NOTE :
To blank out a line, type a carriage return after the change command. All the non-blank lines below will copy up. Take care NOT to have blank lines between grouping lines!

***** END EXAMPLE *****

This system has been designed to avoid entering any data that duplicates data in existing groups. The system will not even permit you to overwrite duplicate information in the line to be changed. To change a line with duplicated information, you must first enter (cr) to display the line, enter c to change the line, then enter (cr) to delete the line. You may now enter the new group, providing it does not duplicate in part some other line.

To avoid blank groups, the system moves up any non-blank lines from below the lines being deleted. This means you must reenter all lines below the line being deleted.

***** EXAMPLE OF group COMMAND SESSION FOR *****
CREATING WORKSHEET 2

command : group

*** Line editor for entering grouping data ***

:: h [displays header]

group number (1-15)	lcc (1-8)	important farmland (p,s,l, or o)	low prod. index (0-100)	high prod index (0-100)

:: (cr) [enter (cr) to display this and succeeding groups]
1 -- 1 1 p 60 100
:: (cr)
2 -- 2 2e-2s p 80 100
:: (cr)
3 -- 3 2e-2s p 10 79
:: (cr)
4 -- 4 2e-2s s 10 100
:: (cr)
5 -- 5 3e-3s p 10 100
:: (cr)
6 -- 6 3e-3s s 10 100
:: (cr)
7 -- 7 7e-7s o 0 0

:: (cr)
8 --
:: c1 [to change line 1]
new line : 1 1 p 80 100

[Current entry duplicates some other entry. Entire line is ignored.]

:: c1 [to try again]
new line : (cr) [this time enter (cr) to delete line]

:: c [now change the blank line by entering 1 1 p 80 100]
new line : 1 1p 80 100

:: (cr) [brings up line from below]
2 -- 3 2e-2s p 10 79

:: c [to change line 2]
new line : 2 1 p 40 79

:: w [to write to disk]
record is written

:: q

***** END EXAMPLE *****

Listing Worksheet 2

After you are satisfied with the groups that you have constructed, you can print worksheet 2 by invoking the command W2. If you like it, save it. Remember, the save command writes over previous revisions.

If this session is complete, type done to start a new session. This command will also delete anything that is not saved on disk, so save first.

Logging Off

After you are done using CALES type bye, or press control-d (both keys at the same time). At this point, you will get another '$' prompt from the Pyramid. Another control-d will put you back into Telenet.

9 INFORMATION AND ACCOUNTS

ETIS is available through the ETIS Project, a support facility operated by the University of Illinois Department of Urban and Regional Planning. To reach this center, contact:

Lynn Engelman, Program Coordinator
login name: engelman
Department of Urban and Regional Planning
University of Illinois at Urbana-Champaign
909 West Nevada, Urbana, IL 61801
(217) 333-1369

The ETIS Project staff provides assistance to ETIS users, establishes accounts for new users, offers training courses on the ETIS systems (including the Interactive Soils Information System), distributes user manuals, and periodically publishes ETIS newsletters.

Free guest accounts are available upon request for trial use of any ETIS system. If you have already tried an ETIS system and anticipate continued use, a user account can be established through the ETIS Project.

The ETIS Project staff can assist users with specific application problems. If additional information is required, other points of contact for the Interactive Soils Information System are:

U.S. Army Construction Engineering Research Laboratory (USA-CERL)

William Goran or Pamela Thompson
logins: goran (or) pthomp
P.O. Box 4005
Champaign, IL 61820-1305
FTS 958-7448 (Goran)
Commercial (217) 352-6511 ext 448 (Goran) ext 474 (Thompson)

U.S. Department of Agriculture-Soil Conservation Service:

Maurice Mausbach
login name: mausbach
USDA-SCS National Office
P. O. Box 2890
Washington DC 20013
FTS 382-1811 Commercial 202-382-1811

CITED REFERENCES

National Agricultural Land Evaluation and Site Assessment Handbook (Soil Conservation Service, 1983).

National Soils Handbook (Soil Conservation Service, 1983).

UNCITED REFERENCES

ETIS and its subsystems (ETIS Project, Dept. of Urban and Regional Planning, University of Illinois, Urbana, IL 1986).

Goran, W. D., *An Interactive Soils Information System Users Manual.* Technical Report N-163 ADA (U. S. Army Corps of Engineers [USA-CERL], September 1983).

Olson, G. W., *Soils And The Environment, A Guide To Soil Surveys And Their Applications* (Chapman and Hall, New York, NY, 1981).

Soil Conservation Service, *Land resource regions and major land resource areas of the United States*, U. S. Department of Agriculture Handbook 296 (U. S. Government Printing Office Washington, D. C., 1981).

Soil Conservation Service, *Soil Survey Manual*, U. S. Department of Agriculture Handbook 18 (U. S. Government Printing Office, Washington, D. C., 1951).

Soil Conservation Service, *Soil Taxonomy*, U. S. Department of Agriculture Handbook 436 (U. S. Government Printing Office, Washington, D. C., 1975).

APPENDIX A:

MPSS EXAMPLE SESSION
(including example using taxonomy codes)

Suppose a researcher is interested in knowing what soils in New Jersey may be the most susceptible to impact by acid rain. Generally, sandy soils with low organic matter content and low to neutral ph values are more sensitive to changes caused by acid rain.

In this example, a search is conducted to find all soils in New Jersey with ph values less than 7 and greater than 4, organic matter content less than 4% (in the surface layer), and with a sandy soil texture at the surface and at 25 inches depth. This is all done using the FIND and AND commands.

Next, a list of 22 Soil Interpretation Records meeting the specified criteria is obtained by using the LIST or L command. A list of counties containing these soils and the total acreage of the soils in each county can be generated by the command COMUUF (this command accesses the SOI-6 database).

The SHOW command produces tables showing a list of soils that are contained in each of the classes for ph, om, textsur, and text25. The FREQ (frequency) command produces tables providing information on the number of occurances in each class, the percent of the total occurances attributed to each class and the cumulative percentages for each class.

Finally, by entering SIRS, more detailed information on any of the soils can be obtained. Here, only a few soil records were selected to illustrate the procedure, but all of the records could have been passed on by typing 1-22 when the system prompts you to list the number for the series selected to be passed on to SIRS.

The following example briefly illustrates the use of taxonomic codes for searching soils by their suborder, greatgroup or subgroup classification. Here, the system is asked to search for all the soils in Illinois with the classification Typic Udorthents. For a list of taxonomic codes see Appendix D.

```
MULTIPLE PARAMETER SERIES SEARCH
--------------------------------

     A USDA Soil Conservation Service IRM subsystem developed in
     cooperation with the U.S. Army CERL's ETIS group

     SIRS is accessible through this system by typing "sirs "
     Users may select as many soils-5 as there are on the search list
     to be passed on to SIRS

     Type "help" for help. Type control-d or 'q' or "quit" or "done"
     or "bye" to leave the system.

     Latest update --- August, 1986  -  26,700 soils-5 records
```

```
MPSS   f ph <7 and ph >4

        class interval :  >=   6.60  but  <   7.40

        Classes ranged from the first to and including above interval

        18,052 Soil Interpretation Records (SOI-5's) found

        class interval    >=   3.60  but  <   4.50

        Classes ranged from above interval to last interval

        17,951 Soil Interpretation Records (SOI-5's) found

MPSS   and om <4

        class interval :  >=   2.00  but  <   5.00

        Classes ranged from the first to and including above interval

        14,309 Soil Interpretation Records (SOI-5's) found

MPSS   and textsur s

        class :  s, cos, fs, vfs

        1,025 Soil Interpretation Records (SOI-5's) found

MPSS   and text25 s

        class :  s, cos, fs, vfs

        772 Soil Interpretation Records (SOI-5's) found

MPSS   and instate nj

        22 Soil Interpretation Records (SOI-5's) found

MPSS   l

 line
  no     series (record no )
-----    -------------------
    1 - lakeland ( f10001 )
    3 - st  johns ( f10125 )
    5 - plummer ( ga0031 )
    7 - klej ( md0053 )
    9 - klej ( md0079 ) clay substratum
   10 - lakewood ( nj0010 )
   11 - fort mott ( nj0013 )
   13 - evesboro ( nj0016 )
   15 - evesboro ( nj0063 ) clay substratum
   16 - atsion ( nj0086 ) tide flooded
   17 - lakehurst ( nj0087 ) clayey substratum
   18 - colonie ( ny0086 )
   19 - fripp ( sc0001 )
   21 - hooksan ( nj0075 )

 line
  no     series (record no )
-----    -------------------
    2 - leon ( f10051 )
    4 - st  johns ( f10334 ) depressional
    6 - galestown ( md0048 )
    8 - galestown ( md0078 ) stony
   12 - atsion ( nj0015 )
   14 - tinton ( nj0040 )
   20 - leon ( f10406 ) flooded
   22 - klej ( md0104 ) sandy substratum
```

```
MPSS    comuuf
```

`omuuf gives the total acreage for each county that the soil interpretations records appear in. It gives two table options: (1) a list of acreages for each soil record, by the counties they occur in or (2) a list of acreages for each county, by the individual soil records that occur in them.

```
MPSS    show om and ph

        om class    >= 0 but < 1.0
                     1  lakeland ( fl0001 )
                     2  klej ( md0079 ) clay substratum
                     3  evesboro ( nj0016 )
                     4  tinton ( nj0040 )
                     5  evesboro ( nj0063 ) clay substratum
                     6  fripp ( sc0001 )
                     7  hooksan ( nj0075 )

More (CR or Y if yes) ^

        om class    >= 1.0 but < 2.0
                     1  galestown ( md0048 )
                     2  galestown ( md0078 ) stony
                     3  lakewood ( nj0010 )
                     4  fort mott ( nj0013 )
                     5  colonie ( ny0086 )

        om class    >= 2.0 but < 5.0
                     1  leon ( fl0051 )
                     2  st. johns ( fl0125 )
                     3  st. johns ( fl0334 ) depressional
                     4  plummer ( ga0031 )
                     5  klej ( md0053 )
                     6  atsion ( nj0015 )
                     7  atsion ( nj0086 ) tide flooded
                     8  lakehurst ( nj0087 ) clayey substratum
                     9  leon ( fl0406 ) flooded
                    10  klej ( md0104 ) sandy substratum

        ph class    >= 3.6 but < 4.5
                     1  klej ( md0053 )
                     2  klej ( md0079 ) clay substratum
                     3  lakewood ( nj0010 )
                     4  atsion ( nj0015 )
                     5  evesboro ( nj0016 )
                     6  evesboro ( nj0063 ) clay substratum
                     7  lakehurst ( nj0087 ) clayey substratum
```

```
More (CR or Y if yes) ?

                    8. klej ( md0104 ) sandy substratum

        ph class : >= 4.5 but < 5.6
                    1. lakeland ( fl0001 )
                    2. leon ( fl0051 )
                    3. st. johns ( fl0125 )
                    4. st. johns ( fl0334 ) depressional
                    5. plummer ( ga0031 )
                    6. galestown ( md0048 )
                    7. galestown ( md0078 ) stony
                    8. fort mott ( nj0013 )
                    9. tinton ( nj0040 )
                   10. atsion ( nj0086 ) tide flooded
                   11. leon ( fl0406 ) flooded

        ph class : >= 5.6 but < 6.6
                    1. colonie ( ny0086 )
                    2. fripp ( sc0001 )
                    3. hooksan ( nj0075 )


MPSS : show textsur and text25

        textsur class : s, cos, fs, vfs
                    1. lakeland ( fl0001 )
                    2. leon ( fl0051 )
                    3. st. johns ( fl0125 )
                    4. st. johns ( fl0334 ) depressional
                    5. plummer ( ga0031 )
                    6. galestown ( md0048 )
                    7. klej ( md0053 )

More (CR or Y if yes) ?

                    8. galestown ( md0078 ) stony
                    9. klej ( md0079 ) clay substratum
                   10. lakewood ( nj0010 )
                   11. fort mott ( nj0013 )
                   12. atsion ( nj0015 )
                   13. evesboro ( nj0016 )
                   14. tinton ( nj0040 )
                   15. evesboro ( nj0063 ) clay substratum
                   16. atsion ( nj0086 ) tide flooded
                   17. lakehurst ( nj0087 ) clayey substratum
                   18. colonie ( ny0086 )
                   19. fripp ( sc0001 )
                   20. leon ( fl0406 ) flooded
                   21. hooksan ( nj0075 )
                   22. klej ( md0104 ) sandy substratum

        textsur class : ls, lcos, lfs, lvfs
                    1. plummer ( ga0031 )
                    2. galestown ( md0048 )
                    3. klej ( md0053 )
                    4. galestown ( md0078 ) stony
                    5. klej ( md0079 ) clay substratum
```

```
More (CR or Y if yes) ?

                    6. fort mott ( nj0013 )
                    7. atsion ( nj0015 )
                    8. evesboro ( nj0016 )
                    9. tinton ( nj0040 )
                   10. evesboro ( nj0063 ) clay substratum
                   11. colonie ( ny0086 )
                   12. klej ( md0104 ) sandy substratum

        textsur class :  vfsl, l, sil, si
                    1. colonie ( ny0086 )

        textsur class :  by, byv, byx, rb, st, stv, stx
                    1. galestown ( md0078 ) stony

        text25 class :  s, cos, fs, vfs
                    1. lakeland ( fl0001 )
                    2. leon ( fl0051 )
                    3. st. johns ( fl0125 )
                    4. st. johns ( fl0334 ) depressional
                    5. plummer ( ga0031 )
                    6. galestown ( md0048 )
                    7. klej ( md0053 )

More (CR or Y if yes) ?

                    8. galestown ( md0078 ) stony
                    9. klej ( md0079 ) clay substratum
                   10. lakewood ( nj0010 )
                   11. fort mott ( nj0013 )
                   12. atsion ( nj0015 )
                   13. evesboro ( nj0016 )
                   14. tinton ( nj0040 )
                   15. evesboro ( nj0063 ) clay substratum
                   16. atsion ( nj0086 ) tide flooded
                   17. lakehurst ( nj0087 ) clayey substratum
                   18. colonie ( ny0086 )
                   19. fripp ( sc0001 )
                   20. leon ( fl0406 ) flooded
                   21. hooksan ( nj0075 )
                   22. klej ( md0104 ) sandy substratum

        text25 class :  ls, lcos, lfs, lvfs
                    1. leon ( fl0051 )
                    2. st. johns ( fl0125 )
                    3. st. johns ( fl0334 ) depressional
                    4. plummer ( ga0031 )
                    5. galestown ( md0048 )
```

```
More (CR or Y if yes) ?

                    6. klej ( md0053 )
                    7. galestown ( md0078 ) stony
                    8. klej ( md0079 ) clay substratum
                    9. lakewood ( nj0010 )
                   10. fort mott ( nj0013 )
                   11. atsion ( nj0015 )
                   12. evesboro ( nj0016 )
                   13. tinton ( nj0040 )
                   14. evesboro ( nj0063 ) clay substratum
                   15. atsion ( nj0086 ) tide flooded
                   16. lakehurst ( nj0087 ) clayey substratum
                   17. colonie ( ny0086 )
                   18. klej ( md0104 ) sandy substratum

MPSS : freq om and ph

  number of   % of   cumulative
occurrances  total  percentages  om classes
-----------  -----  -----------  ----------------
          7     32           32  >= 0 but < 1.0
          5     23           55  >= 1.0 but < 2.0
         10     45          100  >= 2.0 but < 5.0

*-*-*-*-*-*-*

  number of   % of   cumulative
occurrances  total  percentages  ph classes
-----------  -----  -----------  ----------------
          8     36           36  >= 3.6 but < 4.5
         11     50           86  >= 4.5 but < 5.6
          3     14          100  >= 5.6 but < 6.6

*-*-*-*-*-*-*


MPSS : freq textsur and text25

  number of   % of   cumulative
occurrances  total  percentages  textsur classes
-----------  -----  -----------  ----------------
         22     61           61  s, cos, fs, vfs
         12     33           94  ls, lcos, lfs, lvfs
          1      3           97  vfsl, l, sil, si
          1      3          100  by, byv, byx, rb, st, stv, stx

*-*-*-*-*-*-*

  number of   % of   cumulative
occurrances  total  percentages  text25 classes
-----------  -----  -----------  ----------------
         22     55           55  s, cos, fs, vfs
         18     45          100  ls, lcos, lfs, lvfs

*-*-*-*-*-*-*
```

```
MPSS : sirs

Select series to be passed on to SIRS


List Number (from listing  --  CR to leave)
: 1-2

SOILS-5 INTERPRETATIONS RETRIEVAL SYSTEM
----------------------------------------


Table option (CR for choices) :

        Type    for table or listing showing
        ----    ----------------------------
          0     brief soil description
          1     soil properties - select your own
          2     additional properties not in 1 or 3
          3     flooding and high water table
          4     use interpretations
          5     capability and yield
          6     woodland suitability
          7     windbreaks
          8     wildlife habitat suitability
          9     potential native plants
          10    to terminate table selection

        q, quit, done or bye to leave the system

        list or l to see list passed from MPSS

Table option (CR for choices) : 0

*-*-*-*-*-*-*-*-*-*-*-*

lakeland ( f10001 )

        mlra(s): 133a, 137 , 138 , 152a, 153a, 133b, 153b, 149a, 153c
        rev. agh, 7-82
        typic quartzipsamments, thermic, coated

        the lakeland series consists of excessively drained nearly level to
        steep soils on coastal plain uplands. typically, these soils have a
        very dark grayish brown sand surface layer about 3 inches thick.
        yellowish brown sand occurs between depths of 3 and 64 inches, and
        below 64 inches to depths of 90 inches or more very pale brown sand
        occurs. slopes range from 0 to 30 percent.
```

--*-*-*-*-*-*-*-*-*-*

leon (f10051)

mlra(s): 152a, 153a, 133a, 153b, 153c
rev. hfh, 3-83
aeric haplaquods, sandy, siliceous, thermic

the leon series consists of poorly drained sandy soils that occur in the lower atlantic and gulf coastal plain flatwoods. typically, they have a 3 inch thick very dark gray sand surface layer and a 12 inch thick gray and light gray sand subsurface layer. the subsoil is black, dark reddish brown and dark brown sand 15 inches thick. the substratum is brown, light brownish gray or very dark brown sand to 80 inches or more deep. slopes are 0 to 5 percent.

--*-*-*-*-*-*-*-*-*-*

Table option (CR for choices) : 10

APPENDIX B:

MUUFS EXAMPLE SESSION

Suppose a wildlife manager is interested in finding areas in Champaign County, IL that would be suitable for wetland wildlife. In this MUUFS example, the soils being searched are those soils in Champaign County, Illinois that have the phase criteria, frequently flooded. Using the LIST or L command generates a list of the soils meeting the criteria frequently flooded. For Champaign County, only one soil meets this criteria, Ambraw. This soil is listed along with it's FIPS number, map symbol, and total map unit acres in the county.

The map unit Ambraw is then passed on to SIRS for information on its potential for wildlife habitat on these soils. Note that Ambraw has three records. All three were selected for the SIRS session.

```
MAP UNIT USE FILE SYSTEM
--- ---- --- -----------

        A USDA Soil Conservation Service IRM subsystem

        170,455 Mapping Units in the current database as of January, 1986

        Type "help" for help. Type control-d or 'q' or "quit" or "done"
        or "bye" to leave the system.

        NOTE : flooding frequency key "flood" has been changed to "floodfr "

MUUFS   ? floodfr f

        Flooding frequency : frequent

         6,238 map units found

MUUFS   and county champaign, il

        county : champaign , illinois

        1 map units found

MUUFS   l
```

FIPS	map symbl	munit acres	map unit name
17019	302	2,687	ambraw silty clay loam
	TOTAL	2,687	

```
MUUFS : sirs

SOILS-5 INTERPRETATIONS RETRIEVAL SYSTEM
----------------------------------------

Selection ( CR if done ) : ambraw

        Multiple records for ambraw (select by record numbers) :
                i10356  ponded
                i10369  sandy substratum
                i10103

Selection ( CR if done ) : i10356

Selection ( CR if done ) : i10369

Selection ( CR if done ) : i10103

Selection ( CR if done ) :

Table option (CR for choices) :

        Type    for table or listing showing
        ----    ----------------------------
          0     brief soil description
          1     soil properties - select your own
          2     additional properties not in 1 or 3
          3     flooding and high water table
          4     use interpretations
          5     capability and yield
          6     woodland suitability
          7     windbreaks
          8     wildlife habitat suitability
          9     potential native plants
          10    to terminate table selection

        q, quit, done or bye to leave the system

        list or l to see list passed from MPSS

Table option (CR for choices) : 8

*-*-*-*-*-*-*-*-*-*-*-*

Unit Name :  ambraw ( i10356 )ponded
-----------
```

class-determining phase	potential for habitat elements							
	grain & seed	grass & legume	wild herb.	hardwd trees	conifer plants	shrubs	wetland plants	shallow water
drained	good	fair	good	good	fair	-	good	good
undrained	v. poor	fair	fair	fair	poor	-	good	good

```
         ---- continue -----
```

potential as habitat for:			
openland wildlife	woodland wildlife	wetland wildlife	rangeland wildlife
good	good	good	-
fair	poor	good	-

Unit Name : ambraw (il0369)sandy substratum

class-determining phase	potential for habitat elements							
	grain & seed	grass & legume	wild herb.	hardwd trees	conifer plants	shrubs	wetland plants	shallow water
all	v. poor	v. poor	v. poor	v. poor	v. poor	-	good	good

----- continue -----

potential as habitat for:			
openland wildlife	woodland wildlife	wetland wildlife	rangeland wildlife
very poor	fair	good	-

Unit Name ambraw (il0103)

class-determining phase	potential for habitat elements							
	grain & seed	grass & legume	wild herb.	hardwd trees	conifer plants	shrubs	wetland plants	shallow water
all	good	fair	good	good	fair	-	good	good

--- continue -----

potential as habitat for:			
openland wildlife	woodland wildlife	wetland wildlife	rangeland wildlife
good	good	good	-

APPENDIX C:

SIRS EXAMPLE SESSION

In the following example, the soil series Muscatine is selected. This soil has two records, Muscatine (ia0246) sandy substratum and Muscatine (ia0052). For this session, only the Muscatine (ia0246) sandy substratum record is selected. The example illustrates the use of SIRS and the types of detailed soils information that can be generated by it. For some table options, the system will respond with NO TABLE AVAILABLE. This is usually because the information in that particular table option does not apply to the soil selected.

```
SOILS-5 INTERPRETATIONS RETRIEVAL SYSTEM
----------------------------------------

        A joint project of the USDA Soil Conservation Service IRM group
        and the U.S. Army CERL's ETIS group

        Selection is made by entering soils-5 name or record number
        Type carriage return (CR) when the selection process is over

        Type control-d or 'q' or "quit" or "done" or "bye" to leave

        Most current data --- June, 1986  -  26,463 records

Selection ( CR if done ) : muscatine

        Multiple records for muscatine (select by record numbers) :
                ia0246  sandy substratum
                ia0052

Selection ( CR if done ) : ia0246

Selection ( CR if done ) :

Table option (CR for choices) : 0

*-*-*-*-*-*-*-*-*-*-*-*

muscatine ( ia0246 )sandy substratum

        mlra(s): 104 , 105
        rev. jrn, 5-84
        aquic hapludolls, fine-silty, mixed, mesic

        the muscatine series, sandy substratum, consists of somewhat poorly
        drained soils formed in loess over coarse sediments  under tall
        prairie grasses. the surface soil is black silt loam and very dark
        brown silty clay loam 21 inches thick. the subsoil is grayish brown
        mottled silty clay loam in upper 26 inches and yellowish brown sandy
        loam in lower 8 inches.  the substratum is yellowish brown loamy san
        slopes are 0 to 2 percent. most areas are used for cropland.

*-*-*-*-*-*-*-*-*-*-*-*
```

```
Table option (CR for choices) : 1

        ----Type 'list' or 'l' for a table list. Type 'help' for help.----

        ---- 1 series available for this session ----

Current series : muscatine ( ia0246 )sandy substratum
---------------

        Table entries (type CR if done)
           all

Unit Name : muscatine ( ia0246 )sandy substratum
---------
```

depth (in)	texture	unified	aashto	organic matter (pct)	fract > 3in (pct)	liquid limit
0-14	sil	cl-ml,cl	a-4,a-6	5-6	0	25-40
14-47	sicl	cl	a-7		0	40-50
47-55	sl,l	sm-sc,sc	a-4		0	20-30
55-60	ls,s	sp-sm,sm,sm-sc	a-2,a-3		0	< 20

--- continue ---

plasticity index	clay %<2mm	permeability (in/hr)	available water (in/in)	erosion factors k	erosion factors t	moist bulk density (g/cm3)	soil reaction (ph)
5-15	24-27	0.6-2.0	0.22-0.24	.28	5	1.25-1.35	5.1-7.3
20-30	30-34	0.6-2.0	0.18-0.20	.43		1.25-1.35	5.1-6.0
5-10	15-20	2.0-6.0	0.11-0.17	.24		1.25-1.35	5.1-7.3
np-5	3-10	6.0-20	0.05-0.10	.24		1.30-1.35	6.1-7.3

--- continue ---

salinity mmhos/cm	shrink-swell	wind erod group	percent of material less than 3 in passing sieve no 4	10	40	200
-	moderate	6	100	100	100	95-100
-	moderate		100	100	100	95-100
-	low		100	95-100	80-90	35-50
-	low		100	95-100	80-90	5-20

```
        Table entries (type CR if done)

Table option (CR for choices) : 2
```

corrosivity steel	corrosivity concrete	cemented pan depth (in)	cemented pan hardness	bedrock depth (in)	bedrock hardness	subsidence init (in)	subsidence total (in)	hyd grp	potential frost
muscatine (ia0246)sandy substratum									
high	moderate	-		> 60		-	-	b	high

Table option (CR for choices) : 3

--*-*-*-*-*-*-*-*-*

Unit Name : muscatine (ia0246) sandy substratum

flooding			high water table		
frequency	duration	months	depth(ft)	kind	months
none		-	2.0-5.0	apparent	nov-jul

--*-*-*-*-*-*-*-*-*

Table option (CR for choices) : 4

----Type 'list' or '1' for a list of choices. Type 'help' for help ----

---- 1 series available for this session ----

Current series : muscatine (ia0246)sandy substratum

Use Interpretation (type CR if done)
.. all

****

septic tank absorption fields

severe - wetness

sewage lagoons

severe - wetness , seepage

sanitary landfill(trench)

severe - seepage , wetness

sanitary landfill(area)

severe - wetness

daily cover for landfill

fair - wetness

footnote :

the porous material below about 4 feet may cause pollution of ground water.

****

shallow excavations

severe - cutbanks cave , wetness

dwellings without basements

moderate - wetness , shrink-swell

dwellings with basements
severe - wetness

small commercial buildings
moderate - wetness , shrink-swell

local streets and roads
severe - low strength , frost action

lawns, landscaping, and golf fairways
slight

****

roadfill
fair - wetness

sand
probable

gravel
improbable - too sandy

topsoil
good

****

pond reservoir area
moderate - seepage

embankments, dikes and levees
moderate - wetness

excavated ponds-aquifer fed
severe - cutbanks cave

drainage
- frost action

irrigation
- wetness

terraces and diversions
- wetness , erodes easily

grassed waterways
- erodes easily

****

camp areas
---
moderate - wetness

picnic areas
---
moderate - wetness

playgrounds
---
moderate - wetness

path and trails
---
slight

****

Use Interpretation (type CR if done)

Table option (CR for choices) : 5

Unit Name : muscatine (ia0246)sandy substratum

class-determining phase	capability	corn bu(s)		soybeans bu(s)		oats bu(s)		grass-legume hay ton(s)	
		nirr	irr.	nirr	irr.	nirr	irr.	nirr	irr
all	1		153		51		92		6.1

--- continue ---

bromegrass-alfalfa aum		kentucky bluegrass aum		smooth bromegrass aum	
nirr	irr.	nirr	irr.	nirr	irr.
8.6		4.1		7.5	

Table option (CR for choices) : 6

Unit Name muscatine (ia0246)sandy substratum

NO TABLE AVAILABLE

Table option (CR for choices) 7

Unit Name muscatine (ia0246)sandy substratum

class-determining phase	species	ht	species	ht
all	eastern white pine	30	silver maple	40
	white spruce	20	Austrian pine	30
	common hackberry	32	blue spruce	22
	northern white-cedar	20	green ash	32
	Amur maple	23	Tatarian honeysuckle	13
	lilac	12	redosier dogwood	12

Table option (CR for choices) 8

Unit Name muscatine (ia0246)sandy substratum

class-determining phase	potential for habitat elements							
	grain & seed	grass & legume	wild herb	hardwd trees	conifer plants	shrubs	wetland plants	shallow water
all	good	good	good	good	good	-	fair	fair

----- continue -----

potential as habitat for:			
openland wildlife	woodland wildlife	wetland wildlife	rangeland wildlife
good	good	fair	-

Table option (CR for choices) 9

Unit Name muscatine (ia0246) sandy substratum

NO TABLE AVAILABLE

Table option (CR for choices) 10

APPENDIX D:

LIST OF TAXONOMIC CODES

GREAT GROUP CODES

ALFISOLS

AAGAL Albaqualf
AAQNA Natraqualf
AAQOC Ochraqualf
ABOCR Cryoboralf
ABOGL Glossoboralf
AUDAG Agrudalf
AVDFS Fraglossvdalf
AUDKA Kandivdalf
AUDPA Paleudalf
AUSKA Kandivstalf
ANSPA Paleustalf
AXEDV Durixeralf
AXENA Natrixeralf
AXERH Rhodoxeralf

AAQDV Duraqualf
AAQGL Glossaqualf
AAQPN Plinthaqualf
ABOEV Evtroboralf
ABONA Natriboralf
AUDFE Ferrudalf
AUDGL Glossudalf
AUDKH Kanhapluvdalf
AUSDV Durvstalf
AVSKH Kanhaplustalf
AUSPN Plinthustalf
AXEFR Fragixeralf
AXEPA Palexeralf

AAQFR Fragiaqualf
AAQKA Kandiaqualf
AAQUM Umbraqualf
ABOFR Fragiboralf
ABOPA Daleboralf
AUDFR Fragivdalf
AUDHA Hapludalf
AUDNA Natrudalf
AUSHA Haplustalf
AUSNA Natrustalf
AUSRH Rhodustalf
AXEHA Haploxeralf
AXEPN Plinthoxeralf

ARIDISOLS

DARDU Durargid
DARNT Natrargid
DORCM Camborthid
DORPA Paleorthid

DARHA Haplargid
DAROA Paleargid
DORDU Durorthid
DORSA Salorthid

DARND Nadurargid
DORCL Caldiorthid
DORGY Gypsiorthid

ENTISOLS

EAQCR Cryaquent
EAQHY Hydraquent
EAQTR Tropaquent
EFLTO Torrifluvent
EFLUS Ustifluvent
EORTO Torriorthent
EORUS Ustorthent
EPSQU Quartzipsamment
EPSUD Udipsamment

EAQFL Fluvaquent
EAQPS Psammaquent
EARAR Arent
EFLTR Tropofluvent
EFLXE Xerofluvent
EORTR Troporthent
EORXE Xerorthent
EOSTO Torripsamment
EOSUS Ustipsamment

EAQHA Haplaquent
EAQSU Sulfaquent
EFLCR Cryofluvent
EFLUD Udifluvent
EORCR Cryothent
EORUD Udorthent
EOSCR Cryopsamment
EPSTR Tropopsamment
EOSXE Xeropsamment

HISTOSOLS

HFIBO Borofibrist
HFIME Medifibrist
HFOBO Borofolist
HHEME Medihemist
HHETR Tropohemist
HSAME Medisaprist

HFICR Cryofibrist
HFISP Sphagnofibrist
HFOCR Cryofolist
HHESI Sulfihemist
HSABO Borosaprist
HSATR Troposaprist

HFILU Luvifibrist
HFITR Tropofibrist
HFOTR Tropofolist
HHESO Sulfohemist
HSACR Cryosaprist

INCEPTISOLS

IANCR Cryandept
IANEU Eutrandept
IANVI Vitrandept
IAQFR Fragiaquept
IAQHU Humaquept

IANDU Durandept
IANHY Hydrandept
IAQAN Andequept
IAQHL Halaquept
IAQPK Placaquept

IANDY Dystrandept
IANPK Placandept
IAQCR Cryaquept
IAQHP Haplaquept
IAQPN Plinthaquept

IAQSU Sulfaquept
IOCDU Durochrept
IOCFR Fragiochrept
IPLPL Plaggept
ITRHU Humitropept
IUMCR Cryumbrept

IAQTR Tropaquept
IOCDY Dystrochrept
IOCUS Ustochrept
ITRDY Dystropept
ITROSO Sombritropept
IUMFR Fragiumbrept

IOCCR Cryochrept
IOCEU Eutrochrept
IOCXE Xerochrept
ITREU Eutropept
ITRUS UStropept
IUMHA Haplumbrept

MOLLISOLS

MALAE Argialboll
MAQCA Calciaquoll
MAQHA Haplaquoll
MBOCA Calcibroroll
MBONA Natriboroll
MRERE Rendoll
MUDPA Paleudoll
MUSCA Calciustoll
MUSNA Natrustoll
MXEAR Argixeroll
MXEHA Haploxeroll

MALNA Natralboll
MAQCR Cryaquall
MAQNA Natraquoll
MBOCR Cryoboroll
MBOPA Paleboroll
MUDAR Argiudoll
MUDVE Vermudoll
MUSDU Durustoll
MUSPA Paleustoll
MXECA Calcixeroll
MXENA Natrixeroll

MAQAR Argiaquoll
MAQDU Duraquoll
MBOAR Argiboroll
MBOHA Haploboroll
MBOVE Vermiboroll
MUDHA Hapludoll
MUSAR Argiustoll
MUSHA Haplustoll
MUSVE Vermustoll
MXEDU Durixeroll
MXEPA Palexeroll

OXISOLS

OAQGI Gibbsiaquox
OAQUM Umbraquox
OHUHA Haplohumox
OOREU Eutrorthox
OORSO Sombriorthox
OUSAC Acrustox
OUSHA Haplustox

OAQOC Ochraquox
OHUAC Acrohumox
OHUSO Sombrihumox
OORGI Gibbsiorthox
OORUM Umbriorthox
OUSEU Eutrustox
OUSSO Sombriustox

OAQPN Plinthaquox
OHUGI Gibbsihumox
OORAC Acrorthox
OORHA Haplorthox
OTOTO Torrox

SPODOSOLS

SAQCR Cryaquod
SAQHA Haplaquod
SAQTR Tropaquod
SHUFR Fragihumod
SHUTR Tropohumod
SORHA Haplorthod

SAQDU Duraquod
SAQPK Placaquod
SFEFE Ferrod
SHUHA Haplohumod
SORCR Cryorthod
SORPK Placorthod

SAQFR Fragiaquod
SAQSI Sideraquod
SHUCR Cryohumod
SHUPK Placohumod
SORFR Fragiorthod
SORTR Troporthod

ULTISOLS

UAQAL Albaquult
UAQKH Kanhaplaquult
UAQPN Plinthaquult
UHUKA Kandihumult
UHUSO Sombrihumult
UUDKA Kandivdult
UUDPN Plinthudult
UUSKA Kandivstult
UUSPN Plinthvstult
UXEPA Palexerult

UAQFR Fragiaquult
UAQOC Ochraquult
UAQUM Umbraquult
UHUKH Kanhaplohumult
UUDFR Fragivdult
UUDKH Kanhapludult
UUDRH Rhodudult
UUSKH Kanhaplustult
UUSRH Rhodustult

VAQKA Kandiaquult
UAQPA Paleaquult
UHUHA Haplohumult
UHUPN Plinthohumult
UUDHA Hapludult
UUDPA Paleudult
UUSHA Haplustult
UUSPA Paleustult
UXEHA Haploxerult

VERTISOLS

VTOTO Torrert
VUSCH Chromustert

VUDCH Chromudert
VUSPE Pellustert

VUDPE Pelludert
VXECH Chromxerert

SUBGROUP CODES

AA	Typic	AB	Abruptic
AB04	Abruptic aridic	AB0	Abruptic cryic
AB10	Abruptic haplic	AB14	Abruptic ultic
AB16	Abruptic xerollic	AE	Aeric
AE03	Aeric arenic	AE05	Aeric grossarenic
AE06	Aeric humic	AE08	Aeric mollic
AE09	Aeric tropic	AE10	Aeric umbric
AE12	Aeric xeric	AL	Albaquic
AL02	Albaquultic	AL04	Albic
AL08	Albic glossic	AL10	Alfic
AL13	Alfic andeptic	AL12	Alfic arenic
AL16	Alfic lithic	AN24	Andaqueptic
AN01	Andeptic	AN11	Andeptic glossoboric
AN	Andic	AN06	Andic dystric
AN22	Andic ustic	An30	Anthropic
AQ	Aqualfic	AQ02	Aquentic
AQ04	Aqueptic	AQ06	Aquic
AQ08	Aquic arenic	AQ14	Aquic duric
AQ16	Aquic duriorthidic	AQ18	Aquic dystric
AQ24	Aquic haplic	AQ26	Aquic lithic
AQ31	Aquic psammentic	AQ34	Aquollic
AQ36	Aquultic	AR	Arenic
AR02	Arenic ardic	AR03	Arenic orthoxic
AR04	Arenic plinthaquic	AR06	Arenic plinthic
AR08	Arenic rhodic	AR10	Arenic ultic
AR14	Arenic umbric	AR16	Arenic ustalfic
AR18	Arenic ustollic	AR22	Argiaquic
AR24	Argiaquic xeric	AR26	Argic
AR28	Argic lithic	AR30	Argic pachic
AR32	Argic vertic	AR34	Aridic
AR36	Ardic calcic	AR42	Aridic duric
AR50	Ardic pachic	AR52	Aridic petrocalcic
AN03	Andaquic	BO	Boralfic
BO02	Boralfic lithic	BO04	Boralfic udic
BO06	Borollic	BO08	Borollic glossic
BO10	Borollic lithic	BO12	Borollic vertic
CA	Calcic	CA04	Calcic pachic
CA06	Calciorthidic	CA10	Calcixerollic
CA20	Cambic	CH	Chromic
CH06	Chromudic	CR	Cryic
CR10	Cryic lithic	CR14	Cryic pachic
CU	Cumulic	CU02	Cumulic udic
CU04	Cumulic ultic		
DU	Durargidic	DU02	Duric
DU08	Durixerollic	DU10	Durixerollic lithic
DU11	Durochreptic	DU12	Durorthidic
DU14	Durorthidic xeric	DY02	Dystric
DY03	Dystric entic	DY04	Dystric fluventic
DY06	Dystric lithic	DY08	Dystropeptic

EN	Entic	ENØ2	Entic lithic
ENØ6	Entic ultic	EP	Epiaquic
EP1Ø	Epiaquic orthoxic	EU	Eutric
EUØ2	Eutrochreptic	EUØ4	Eutropeptic
FE	Ferrudalfic	FI	Fibric
FIØ2	Fibric terric	FLØ2	Fluvaquentic
FLØ6	Fluventic	FL12	Fluventic umbric
FR1Ø	Fragiaquic	FR18	Fragic
GLØ2	Glossaquic	GLØ4	Glossic
GL1Ø	Glossic udic	GL12	Glossic ustollic
GL14	Glossoboralfic	GL16	Glossoboric
GR	Grossarenic	GRØ1	Grossarenic entic
GRØ4	Grossarenic plinthic		
HAØ1	Haplaquic	HA	Haplaquodic
HAØ2	Haplic	HAØ5	Haplohumic
HAØ7	Haploxerollic	HAØ9	Hapludic
HA12	Hapludollic	HA16	Haplustollic
HE	Hemic	HEØ2	Hemic terric
HI	Histic	HIØ2	Histic lithic
HIØ6	Histic pergelic	HU1Ø	Humaqueptic
HU	Humic	HUØ2	Humic lithic
HUØ5	Humic pergelic	HUØ6	Humoxic
HY	Hydric	HYØ2	Hydric lithic
LE	Leptic	LI	Limnic
LIØ2	Lithic	LIØ4	Lithic mollic
LIØ6	Lithic ruptic-alfic	LIØ7	Lithic ruptic-argic
LIØ9	Lithic ruptic-entic	LIØ8	Lithic ruptic-entic-xerollic
LI13	Lithic ruptic-ultic	LI15	Lithic ruptic-xerochreptic
LI11	Lithic ruptic-xerorthentic	LI1Ø	Lithic udic
LI12	Lithic ultic	LI14	Lithic umbric
LI16	Lithic ustic	LI18	Lithic ustollic
LI22	Lithic xeric	LI24	Lithic xerollic
MO	Mollic	NAØ6	Natric
OC	Ochreptic	ORØ1	Orthic
OR	Orthidic	ORØ2	Orthoxic
OX	Oxic		
PA	Pachic	PAØ2	Pachic udic
PAØ4	Pachic ultic	PAØ6	Paleorthidic
PAØ8	Paleustollic	PA1Ø	Palexerollic
PE	Pergelic	PEØ1	Pergelic ruptic-histic
PEØ2	Pergelic sideric	PEØ4	Petrocalcic
PEØ6	Petrocalcic ustalfic	PEØ8	Petrocalcic ustollic
PE14	Petrocalcic xerollic	PE16	Petroferric
PE2Ø	Petrogypsic	PK	Placic
PK1Ø	Plaggeptic	PK12	Plaggic
PL	Plinthaquic	PLØ4	Plinthic

PLØ6	Plinthudic	PS	Psammaquentic
PSØ2	Psammentic		
QU	Quartzipsammentic		
RE	Rendollic	RH	Rhodic
RUØ2	Ruptic-alfic	RUØ9	Ruptic-lithic
RU11	Ruptic-lithic-entic	RU15	Ruptic-lithic-xerochreptic
RU17	Ruptic-ultic	RU19	Ruptic-vertic
SA	Salorthidic	SAØ2	Sapric
SAØ4	Sapric terric	SI	Sideric
SOØ4	Sombrihumic	SP	Sphagnic
SPØ2	Sphagnic terric	SPØ4	Spodic
SU	Suflic		
TE	Terric		
THØ4	Thapto-histic	THØ6	Thapto-histic tropic
TO	Torrertic	TOØ2	Torrifluventic
TOØ4	Torriorthentic	TOØ6	Torripsammentic
TO1Ø	Torroxic	TR	Tropaquodic
TRØ2	Tropeptic	TRØ4	Tropic
UDØ1	Udalfic	UD	Udertic
UDØ2	Udic	UDØ3	Udollic
UDØ5	Udorthentic	UD1Ø	Udoxic
UL	Ultic	UM	Umbreptic
UMØ2	Umbric	US	Ustalfic
USØ2	Ustertic	USØ4	Ustic
USØ6	Ustochreptic	USØ8	Ustollic
US12	Ustoxic		
VE	Vermic	VEØ2	Vertic
XE	Xeralfic	XEØ2	Xerertic
XEØ4	Xeric	XEØ8	Xerollic

NOTE: The following subgroup modifiers and accompanying codes are new additions to the file.

Acric	AC	Andic Udic	AN12
Acric Planthic	ACØ5	Kandic	KA
Andic Epiaquic	ANØ8	Kanhaplic	KH
Sombric	SO		

PARTICLE SIZE CODES

ØØ2 not used

ØØ5 ashy
ØØ8 ashy over loamy
Ø19 ashy over medial

ØØ7 ashy over cindery
Ø13 ashy over loamy-skeletal
ØØ9 ashy-skeletal

ØØ3 cindery
Ø15 cindery over medial-skeletal
ØØ4 cindery over sandy or sandy-skeletal

ØØ6 cindery over loamy
Ø17 cindery over medial

114 clayey
116 clayey over fragmental
12Ø clayey over loamy-skeletal
118 clayey over sandy or sandy-skeletal
Ø56 clayey-skeletal

122 clayey over fine-silty
124 clayey over loamy

Ø58 clayey-skeletal over sandy

ØØ8 coarse-loamy
Ø82 coarse-loamy over fragmental
Ø84 coarse-loamy over sandy or sandy-skeletal
Ø88 coarse-silty
Ø9Ø coarse-silty over fragmental
Ø92 coarse-silty over sandy or sandy-skeletal

Ø86 coarse-loamy over clayey

Ø94 coarse-silty over clayey

126 fine
1Ø2 fine-loamy over clayey
1ØØ fine-loamy over sandy or sandy-skeletal
Ø97 fine-loamy over cindery
1Ø6 fine-silty
1Ø8 ne-silty over fragmental
11Ø ne-silty over sandy or sandy-skeletal

Ø96 fine-loamy
Ø98 fine-loamy over fragmental

112 fine-sinty over clayey

Ø36 fragmental
Ø72 loamy over sandy or sandy-skeletal
Ø54 loamy-skeletal over clayey
Ø51 loamy-skeletal over fragmental
Ø52 loamy-skeletal over sandy

Ø68 loamy
Ø5Ø loamy-skeletal

Ø1Ø medial
Ø12 medial over cindery
Ø16 medial over fragmental
Ø2Ø medial over loamy-skeletal
Ø22 medial over sandy or sandy-skeletal
Ø24 medial over thixotropic

Ø14 medial over clayey
Ø18 medial over loamy

Ø11 medial-skeletal

Ø62 sandy
Ø66 sandy over clayey
Ø44 sandy-skeletal
Ø47 sandy-skeletal over clayey

Ø63 sandy or sandy-skeletal
Ø64 sandy over loamy
Ø46 sandy-skeletal over loamy

Ø26 thixotropic
Ø28 thixotropic over fragmental
Ø32 thixotropic over loamy-skeletal
Ø3Ø thixotropic over sandy or sandy-skeletal
Ø27 thixotropic-skeletal

Ø34 thixotropic over loamy

134 very fine

MINERALOGY CODES

Ø2 not used
Ø4 calcareous
Ø5 carbonatic
Ø9 chloritic
Ø7 clastic
Ø8 coprogenous
1Ø diatomaceous
12 ferrihumic
14 ferritic
16 gibbsitic
2Ø glauconitic
22 gypsic
24 halloysitic
26 illitic
27 illitic (calcareous)
28 kaolinitic
3Ø marly
32 micaceous
34 mixed
35 mixed (calcareous)
37 montmorillonitic
38 montmorillonitic (calcareous)
42 sepiolitic
44 serpentinitic
4Ø oxidic
5Ø vermiculitic
46 siliceous

REACTION CODES

Ø2 not used
Ø4 acid
Ø8 dysic
1Ø euic
12 nonacid
14 noncalcareous

TEMPERATURE REGIME CODES

Ø2 not used
Ø4 frigid
Ø6 hyperthermic
Ø8 isofrigid
1Ø isohyperthermic
12 isomesic
14 isothermic
16 mesic
18 thermic

OTHER FAMILY CODES

Ø2 not used
Ø4 coated
Ø5 cracked
Ø6 level
Ø8 micro
12 ortstein
14 shallow
17 shallow & coated
15 shallow & uncoated
16 sloping
2Ø uncoated

APPENDIX E:

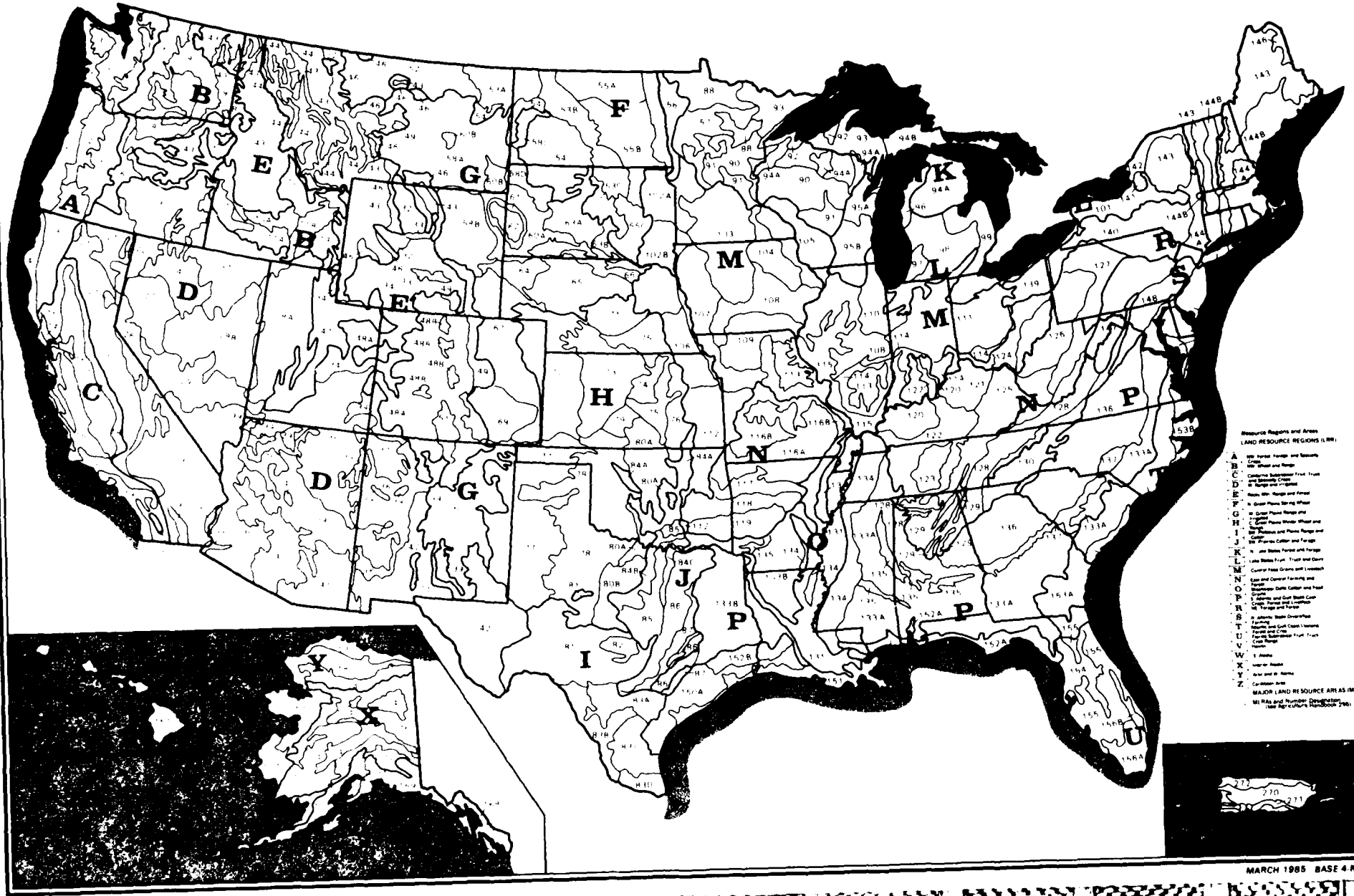
MLRA MAP

Soil Conservation Service, U. S. Department of Agriculture, 1981, Land resource regions and major land resource areas of the United States (map and manual). U. S. Department of Agriculture Handbook 296, 156 p.

U.S. DEPARTMENT OF AGRICULTURE

SOIL CONSERVATION SERVICE

LAND RESOURCE REGIONS AND MAJOR LAND RESOURCE AREAS



MARCH 1985 BASE 4-R-38930

USDA SCS NATIONAL CARTOGRAPHIC CENTER FT. WORTH TX. 1984

APPENDIX F:

CLASSES OF MPSS KEYS

aashto	engineering classification at 25" depth
	a-1, a-2, a-3
	a-4
	a-5
	a-6, a-7
	a-8
awc	available water capacity (total inches to 40")
	> = 0 but < 3
	> = 3 but < 4
	> = 4 but < 5
	> = 5 but < 6
	> = 6
bd	bulk density (maximum g/cc within 40" in depth)
	> = 0 but < 1.0
	> = 1.0 but < 1.2
	> = 1.2 but < 1.4
	> = 1.4 but < 1.6
	> = 1.6 but < 1.8
	> = 1.8
brdepth	depth to bedrock (in)
	> 14
	>= 14 but < 20
	>= 20 but < 40
	>= 40 but < 60
	>= 60
brhrdns	bedrock hardness
	soft, hard
clay25	percent clay at 25"
	> = 0 but < 10
	> = 10 but < 18
	> = 18 but < 27
	> = 27 but < 36
	> = 36 but < 60
	> = 60
claysur	percent clay
	>= 0 but < 10
	> = 10 but < 18
	> = 18 but < 27
	> = 27 but < 36
	> = 36 but < 60
	> = 60
corrconc	corrosivity
	low, moderate, high
corrstl	corrosivity
	low, moderate, high
cpdepth	depth to cemented pan (inches)
	> = 0 but < 14
	> = 14 but 20
	> = 20 but 40

	>= 40 but 60
	>= 60
cpthns	thinness of cemented pan
	thin, thick
crops	permissible crop names
	alfalfa-hay, barley, beans-snap, cabbage, corn,corn-silage, cotton-lint, grain-sorghum, grass-hay, grass-legume-hay, grapefruit, oats, oranges, pasture, peanuts, potatoes-irish, rice, soybeans, tobacco, tomatoes, wheat, bahiagrass, kentucky-bluegrass, orchardgrass, plantains, tall-fescue, corn-sweet, cranberries, wheat-winter, grass-clover, blueberries, trefoil-hay, trefoil-grass-hay, trefoil-grass, flooddu - flooding duration
	very brief, brief, long, very long
floodfr	flooding frequency
	common, frequent, none, occasional, rare
floodmo	flooding or water table months
	january, february, march, april, may, june, july, august, september, october, november, december or, jan, feb, mar, apr, may, jun, jul, aug, sep, oct, nov, dec or, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12
fract	fraction > 3" (mean % in surface layer)
	>= 0 but < 1
	>= 1 but < 10
	>= 10 but < 20
	>= 20 but < 30
	>= 30 but < 40
	>= 40 but < 50
	>= 50
frost	potential frost action
	low, moderate, high
ggrp	too long to list, see Soil Taxonomy.
hgrp	hydrologic group
	a, b, c, d
	a/d, b/d, c/d <--- one class
instate	too long to list
k	K factor (surface layer)
	.02, .05, .1, .15, .17, .20, .24, .28, .32, .37, .43, .49, .55, .64
lcc	Land Capability Subclass
	1, 2e, 2c, 2s, 2w, 3e, 3c, 3s, 3w, 4e, 4c, 4s, 4w, 5s, 5w, 6e, 6c, 6s, 6w, 7e, 7c, 7s, 7w, 8e, 8c, 8s, 8w, 8
ll	liquid limit at 25" depth
	>= 0 but < 30
	>= 30 but < 40
	>= 40 but < 50
	>= 50

min	class	reference	class	reference
	01	unclassified	26	illitic
	02	not used	27	illitic (calcareous)
	04	calcareous	28	kaolinitic
	05	carbonatic	30	marly
	07	clastic	32	micaceous
	08	coprogenous	34	mixed

	09	chloritic	35	mixed (calcareous)
	10	diatomaceous	37	montmorillonitic
	12	ferrihumic	38	montmorillonitic (calcareous)
	14	ferritic	40	oxidic
	18	gibbsitic	42	sepiolitic
	20	glauconitic	44	serpentinitic
	22	gypsic	46	siliceous
	24	halloysitic	50	vermiculitic

mlra — too long to list, see map in Appendix H or see reference, Land Resource Regions and Major Land Resource Areas of The United States.

om — organic matter (% in surface layer)
- >= 0 but < 1
- >= 1 but < 2
- >= 2 but < 5
- >= 5 but < 20
- >= 20

other — other family criteria, see Soil Taxonomy.

01	unclassified
02	not used
04	coated
05	cracked
06	level
08	micro
12	ortstein
14	shallow
15	shallow & uncoated
16	sloping
20	uncoated

partsz — particle size family, see Soil Taxonomy.

001	unclassified
002	not used
003	cindery
004	cindery over sandy or sandy-skeletal
005	ashy
006	cindery over loamy
007	ashy over cindery
008	ashy over loamy
009	ashy-skeletal
010	medial
011	medial-skeletal
012	medial over cindery
003	ashy over loamy-skeletal
014	medial over clayey
016	medial over fragmental
018	medial over loamy
020	medial over loamy-skeletal
022	medial over sandy or sandy-skeletal
024	medial over thixotropic
026	thixotropic
027	thixotropic-skeletal
028	thixotropic over fragmental
030	thixotropic over sandy or sandy-skeletal

032 thixotropic over loamy-skeletal
034 thixotropic over loamy
036 fragmental
044 sandy-skeletal
046 sandy-skeletal over loamy
050 loamy-skeletal
051 loamy-skeletal over fragmental
052 loamy-skeletal over sandy
054 loamy-skeletal over clayey
056 clayey-skeletal
058 clayey-skeletal over sandy
062 sandy
063 sandy or sandy-skeletal
064 sandy over loamy
066 sandy over clayey
068 loamy
072 loamy over sandy or sandy-skeletal
080 coarse-loamy
082 coarse-loamy over fragmental
084 coarse-loamy over sandy or sandy-skeletal
086 coarse-loamy over clayey
088 coarse-silty
092 coarse-silty over sandy or sandy-skeletal
094 coarse-silty over clayey
096 fine-loamy
098 fine-loamy over fragmental
100 fine-loamy over sandy or sandy-skeletal
102 fine-loamy over clayey
106 fine-silty
108 fine-silty over fragmental
110 fine-silty over sandy or sandy-skeletal
112 fine-silty over clayey
114 clayey
116 clayey over fragmental
118 clayey over sandy or sandy-skeletal
120 clayey over loamy-skeletal
122 clayey over fine-silty
124 clayey over loamy
126 fine
134 very-fine

perm permeability (minimum in/hr within 40" in depth)
>= 0 but < .06
>= .06 but < .2
>= .2 but < .6
>= .6 but < 2.0
>= 2.0 but < 6.0
>= 6.0 but < 20.0

ph ph
>= 0 but < 3.6
>= 3.6 but < 4.5
>= 4.5 but < 5.6
>= 5.6 but < 6.6
>= 6.6 but < 7.4

>= 7.4 but < 8.5
>= 8.5

ph40 — ph at 40 inches
>= 0 but < 3.6
>= 3.6 but < 4.5
>= 4.5 but < 5.6
>= 5.6 but < 6.6
>= 6.6 but < 7.4
>= 7.4 but < 8.5
>= 8.5

pi — plasticity index at 25" depth
< 4 and NP
>= 4 but < 7
>= 7 but < 15
>= 15 but < 22
>= 22

react — reaction family classes, see Soil Taxonomy.
01 unclassified
02 not used
04 acid
08 dysic
10 eutic
12 nonacid
14 noncalcareous

salt — salinity (maximum within 40")
>= 0 but < 2
>= 2 but < 4
>= 4 but < 8
>= 8 but < 16
>= 16

shsw — shrink swell (maximum within 40")
low, moderate, high, very high

soil — no listing, use record number or series name

state — use alphabetic FIPS code, e.g., VA

stemp — soil temperature family.
01 unclassified
02 not used
04 frigid
06 hyperthermic
08 isofrigid
10 isohyperthermic
12 isomesic
14 isothermic
16 mesic

subg — subgroup modifier, too long to list, see Appendix F for taxonomic codes.

subor — suborder, too long to list, see Appendix F for taxonomic codes.

sve4 — percent passing sieve 4 at 25"
>= 0 but < 25
>= 25 but < 50
>= 50 but < 75
>= 75

sve10 — percent passing sieve 10 at 25"
>= 0 but < 25

>= 25 but < 50
>= 50 but < 75
>= 75

sve40 — percent passing sieve 40 at 25"
>= 0 but < 25
>= 25 but < 50
>= 50 but < 75
>= 75

sve200 — percent passing sieve 200 at 25"
>= 0 but < 25
>= 25 but < 50
>= 50 but < 75
>= 75

t — T factor in surface layer
1, 2, 3, 4, 5

text25 — textures and modifiers at 25"
s, cos, fs, vfs, ls, lcos, lfs, lvfs, sl, cosl, fsl, vfsl, l, sil, si, cl, sicl, scl, sc, sic, c, muck, mpt, de, sp, peat, fb, hm, ce, mk, pt, uwb, wb, cem, ind, marl, ice, gyp, cind, frag, g, sg, cb, cba, cn, cr, crc, fl, gr, grc, grs, sh, sy, cbv, cbx, cnv, cnx, crv, crx, flv, flx, grv, grx, shv, syv, syx, by, byv, byx, rb, st, stv, stx, var, sr

textsur — surface textures and modifiers
same as text25

totlsub — total subsidence (inches)
0, -, blank
> 0 but < 20
>= 20 but < 40
>= 40 but < 60
>= 60

unified — unified classification at 25" depth
gw, gp, gp gm, gp gc, gm, gc, gm gc, sw, sp, sw sm, sw-sc, sp-sm, sm, sc, sm sc, ml, cl ml, cl, mh, ch, ol, oh, pt

weg — wind erodibility group (surface)
1, 2, 3, 4, 4l, 5, 6, 7, 8

wtdepth — depth of high water table (ft)
+ (means ponded)
> 0 but < 1
> 1 but < 3
>= 3 but < 6
>= 6

wtkind — water table kind
apparent, perched, artesian

wtmo — flooding or water table months
january, february, march, april, may, june, july, august, september, october, november, december or, jan, feb, mar, apr, may, jun, jul, aug, sep, oct, nov, dec or 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12

APPENDIX G:

CLASSES OF MUUFS KEYS

county — is too long to be listed here

state — enter either the full state name or a two letter abbreviation or the fips number

mlra — list is too long to be listed here (see mlra map in Appendix H or reference, Land Resource Regions and Major Resource Areas of The United States).

mapkind

type	for
a	association
c	consociation
u	undifferentiated group

prime

type	for
0	not prime
1	all areas prime
2	only drained areas
3	only drained areas protected from flooding or not frequently flooded during the growing season
4	only irrigated areas
5	only drained areas that are either protected from flooding or not frequently flooded during the growing season
6	only irrigated areas that are drained
7	only irrigated areas that are either protected from flooding or not frequently flooded during the growing season

ssa — list is too long to be listed here

muacres

>= 0 and < 1000,>= 1000 and < 5000,

>= 5000 and < 50000,>= 50000 and < 200000,

>= 200000 and < 500000,>= 500000 and < 1000000

>= 1000000

floodfr

type	for
n	none
r	rare
o	occasional
f	frequent
c	common
a	all classes except "none"

kcomp

type	for
f	family
g	taxon above family
m	miscellaneous areas
s	series
t	taxadjunct
v	variant

slope

>= 0 and < 1,>= 1 and < 3,>= 3 and < 6,
>= 6 and < 8, >= 8 and < 12,>= 12 and < 15,
>= 15 and < 25, >= 25 and < 35,>= 35 and < 50,
>= 50

usdatext

type	for
s	sand
cos	coarse sand
fs	fine sand
vfs	very fine sand
ls	loamy sand
lcos	loamy coarse sand
lfs	loamy fine sand
lvfs	loamy very fine sand
sl	sandy loam
cosl	coarse sandy loam
fsl	fine sandy loam
vfsl	very fine sandy loam
vfsl	very fine sandy loam
l	loam
sil	silt loam
si	silt
cl	clay loam
sicl	silty clay loam
scl	sandy clay loam
sc	sandy clay
sic	silty clay
c	clay
muck	muck
mpt	mucky-peat
de	diotomaceous earth
sp	sapric material
peat	peat
fb	fibric material
hm	hemic material
ce	coprogenous earth
mk	mucky
pt	peaty
uwb	unweathered bedrock
wb	weathered bedrock
cem	cemented
ind	indurated
marl	marl
ice	ice or forzen soil
gyp	gypsiferous material
cind	cinders
frag	framental material
g	gravel
sg	sand and gravel
cb	cobbly
cba	angular cobbly
cn	channery
ch	cherty
crc	coarse cherty
fl	flaggy
gr	gravelly
grc	coarse gravelly
grf	fine gravelly

sh	shaly
sy	slaty
cbv	very cobbly
cbx	extremely cobbly
cnv	very channery
cnx	extremely channery
crv	very cherty
crx	extremely cherty
flv	very flaggy
flx	extremely flaggy
grv	very gravelly
grx	extremely gravelly
shv	very shaly
shx	extremely shaly
syv	very slaty
syx	extremely slaty
by	bouldery
byv	very bouldery
byx	extremely bouldery
rb	rubbly
st	stony
stv	very stony
stx	extremely stony
var	variable
sr	stratified

MUUFS: ocriteria

affr, alkali, all, brief
calc surf, coastal, channeled, cold,
common, cool, depth, dissected,
drained, dry, elev, eroded,
eta, ffs, freq, gullied,
high elev, high pe, high ppt, hummocky,
irr, long, long ffs, low elev,
low pe, low ppt, map, maat,
mast, med pe, med ppt, mod alkali,
mod deep, mod saline, mod sal-alk, mod temp,
mod thick, mod well dr, moist, nirr,
noncalc surf, none, noneroded, nonsaline,
north, occas, overwash, partially dr,
rare, rocky, saline, sal-alk,
sev er, shallow, short ffs, sli alkalki,
sli sal-alk, sli saline, smd, south,
str alkali, str sal-alk, str saline, subirr,
sw poorly dr, thick, thick surf, thin surf,
undrained, undulating, warm, well dr,
wet, winter ppt, woodland, v brief,
v cold, v long, v poorly dr, v rocky,
v shallow,

NOTE: affr, depth, elev, eta, ffs, map, maat, mast, pe, and smd are treated as a single class.

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